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ABSTRACT

A project was undertaken to develop an experimental program to help young people acquire a generalized strategy for learning after they leave school. Other objectives of the program were to help teachers improve their understanding and use of various learning strategies, to develop an induction course for those purposes (entitled the "How do I Learn Course"), to develop ideas and materials for the course, and to produce a manual for use in its implementation. Over a 2-year period a basic induction course was developed and pilot tested in two colleges of further education. While the piloting of the course established its value, it also revealed several problems in understanding course content, demands for certain teaching styles, and the necessity of good organizational support. The course manual (included in this report) contains suggestions and materials for use in implementing a similar induction course. Provided in the manual are worksheets, information sheets, exercises, and transparency masters dealing with the following topics: learning to do something from a demonstration, written instruction, and undoing; learning to memorize; learning to understand something; and revising learning methods. (A review of related literature is appended.) (MN)

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Jack Mansell
Director

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Further Education Curriculum Review and Development Unit

PROJECT REPORT

HOW DO I LEARN?

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an experimental programme to introduce
young people and their teachers
to the many ways of learning

Commissioned by the FEU from

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August 1981

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Foreword

The researchers would like to express their gratitude to the staff and students of the two colleges of further education who agreed to take part in the development of the materials contained in this report.

Janet Toye was responsible for the literature review contained in the Appendix, and, in company with other members of ITRU, helped us in the final preparation of the report.

Finally, we would like to thank the Further Education Curriculum Review and Development Unit for enabling us to tackle such an interesting practical and theoretical problem.

SYLVIA DOWNS

PAT PERRY

August 1981

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CHAPTER 1

Introduction

This project was commissioned by the Further Education Curriculum Review and Development Unit to introduce young people and their tutors to the proposition that there are many ways of learning; and to develop an experimental programme which would seek:—

1. To help young people acquire a generalised strategy for learning after they have left school. Whether they go directly into work or continue their education, they should have an understanding of how to learn and a confidence in their ability to cope with learning even in situations which are not ideally organised for it.

2. To help teachers improve their understanding and use of various ways of learning.

3. To develop for these purposes a type of induction course which could be used at the beginning of training courses or further education courses. The intention would be to prepare young people for their future learning by helping them to identify their own learning difficulties, by giving them the opportunity to try out different ways of learning the kind of skills and tasks they will be expected to master during the main period of their course and, where necessary, giving them practice in specific learning techniques. The teacher or instructor in charge of such a course would have a counselling role and would help each student choose and make most effective use of the various experiences on the course.

4. To develop ideas and materials of general value for the kind of induction course outlined by trying them out over a period of two years in two or three educational or training establishments. The project worker in each case would cooperate from the beginning with the teachers or instructors responsible for the teaching of the main part of the students' syllabus, and aim to produce an induction course suitable for students undertaking that syllabus by the end of the two year period.

5. On the basis of up-to-date theory and knowledge about the ways in which young people learn and on the basis of experience gained by working in different institutions over the two year period, to produce a manual which could be used by teachers and instructors in general to help them prepare induction courses for their students at 16–19, and possibly for other groups including adults.

Over a two year period a basic induction course was developed and piloted in two colleges of further education by the researchers working in conjunction with staff from the colleges. The nature of the course, its development and results are discussed in Chapter 2 of this report. (The full research data is available for consultation at both the FEU and ITRU upon request.)

Chapter 3 is concerned with the lessons which were learned regarding the implementation of a programme to develop more awareness of the range of ways of learning in young people and their tutors. As such it provides guidance to those who wish to develop a similar programme in their own establishments.

Chapter 4 is a 'How Do I Learn?' Manual, the basis of an induction course and models of materials which can be further developed for use with particular groups of young people, and possibly other groups such as school children and adults.

The Appendix summarises some of the theoretical background to the project and is accompanied by a Bibliography.

Essentially this project represents an experimental programme. It should not be assumed that conclusions have been firmly reached, materials exhaustively tested or techniques well established. Rather it is an invitation to teachers and trainers to proceed further with the assurance that the researchers would welcome feedback from them.

CHAPTER 2

The Development and Piloting of the Experimental Programme

The pilot induction courses were developed in conjunction with two colleges of further education. Experiences gained at College A were used to revise the materials which were then further tested at College B.

a. Design of the first pilot induction course

The first pilot course was designed with broadly two sets of aims in mind. The primary purpose would be to experiment with a particular method of helping people learn how to learn. There would also be an associated aim which was to gain information about the ways in which people of different academic abilities normally go about the business of learning. Information about how students learned before they had received the course input would also be compared with how they said they learned at the end of the course, and this would provide one measure of the course's effectiveness. Its success would also be judged in terms of its acceptability to the students.

The most challenging aspect of the task facing the researchers was to decide on the content and method of the pilot induction course. How could they make use of ideas from a highly complex body of theory about the nature of learning for the practical and urgent purpose of helping people learn how to learn? Any taxonomy of learning which attempts to deal comprehensively with all learning activity is necessarily very sophisticated, and depends for its interpretation upon well developed powers of analysis. But the people for whom the project was intended included school-leavers, many of whom had left school with no qualifications. Fully elaborated taxonomies of learning were obviously inappropriate on the basis of their intellectual difficulty. In fact, the review of the literature (see Appendix) revealed that relatively little was known about how young people learned and what were the differences, if any, between those who learned effectively and those who did not. Most published research relevant to the age group dealt only with students following academic courses either at 'A' level or at university.

The kind of solution adopted was itself based on the model of learning described in FEU's Experience, Reflection, Learning.[1] It was decided from the start to make the course an experiential one, with activities being the basis for reflection, the development of ideas and the learning of new strategies.

The second important decision was to use a very simple model of learning whereby students would be taught to categorise what is to be learned under the headings of Memorising, Understanding and Doing, which can be represented by the mnemonic MUD.

Memorising

This categorises material which has to be reproduced after a period of time without alteration. Examples are dates, technical terms, names of people and places, poems and telephone numbers. Students first use their usual methods and are then encouraged to try different ones from the many strategies available, eg. linking, grouping, self-testing, and part-learning.

Understanding

This category covers all learning in which it is necessary to see the relationships between different ideas and in which it is necessary to apply general principles. The material dealt with in this introduction is an example. In order to improve their strategies for understanding students are asked to develop their ideas by comparing and contrasting similar activities which they already know about; they are asked to work in pairs to solve problems; and they are asked to formulate questions as a way of expanding their ideas on subject matter which is familiar to them.

Doing

This category covers learning tasks in which physical activity and practice play a significant part. Manual skills of all kinds fall into this category and examples are sewing, drilling, sawing, jumping and bowling. The procedural aspects of doing – proceeding with different parts of the task in the right order – are evident in many of these tasks. During the course, students learn 'doing' strategies, by following a demonstration, by following written instructions, and by *un*doing – taking apart a completed product in order to see how to put it together.

Although most learning tasks involve a number of different types of content it was not difficult to provide tasks which exemplified each of these groupings fairly unambiguously. It was expected that learners would be able to understand such broad and basic distinctions, especially when they had tried out relevant learning tasks for themselves. The learners would also be given the opportunity to try a number of ways of learning appropriate to each type of learning material.

The course which resulted from following these principles would be overall highly structured. But its method of presentation, involving student practical activity, group discussion and class discussion, would be informal. Mentally it would be very demanding, but because there were no attainment tests or similar measures of individual achievement it would not be stressful. Nor would the point of questioning be to establish what was the right answer. It was hoped that all these factors would combine to produce an atmosphere where students would be able to concentrate well on the task in hand, namely how to learn.

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[1] **FEU Experience, Reflection, Learning. April 1978.**

b. The first pilot induction course

A lecturer at College A worked with the researchers in developing a basic course for three groups of students, for two of which he acted as Course Tutor.

The first group entered the college from school, to take a New Opportunities Course.[1] The second group was also straight from school, but taking a combined 'A' level and Hospital Services Course.[2] The third group consisted mostly of people in their 30's who were taking the City and Guilds 730 Teachers' Training Course[3] in the evenings; they came from such trades as carpentry, shorthand typing, hairdressing and hotel management.

The course consisted of five sessions as follows:—

Session 1

An introduction to the concept of 'How Do I Learn?', followed by an exercise to distinguish different learning material leading to the classification under MUD.

This session focused on the students' previous learning and learning methods in order to introduce the idea that the methods and strategies of their own learning were the subject of the course.

Sessions 2, 3 and 4

Learning the three types of material – activities, facts and concepts respectively. Within each section, students considered the ways of learning they would use for a number of tasks, obtained feedback through group discussion on all the learning ways available and experimented with new ways on further tasks. Where necessary the tutor added ways not mentioned by the group.

Session 5

The consolidation of the way in which material to be learned is classified and the various methods which are appropriate.

While the basic methods of learning and the structure of the course were the same for all three groups, where necessary different learning tasks were used so that each group was presented with material which was relevant to its college course. Tasks were chosen on the basis that they were acceptable to the group, capable of creating interest, and enjoyable.

The teachers' training course group covered this material in five two-hour sessions. The two younger groups each had eight two-hour sessions. They were given the extra sessions so that there could be more practice in the various ways of learning.

c. Monitoring the first pilot induction course

Information was collected about the students themselves, their ways of learning and their responses to different parts of the course.

i. The students were asked to complete worksheets during all the course sessions and these provided information about the learning methods they commonly adopted as well as their reactions to new ideas developed during the sessions.

ii. One worksheet, which was completed by all groups at the very beginning of the course, was also completed at the end. This provided a measure of the extent to which students were aware of a greater range of ways of learning relevant to particular tasks at the end of the course as compared with the beginning.

iii. A group of 'A' level Sociology students, who had comparable IQ's to the Combined 'A' level and Hospital Services Course students was used as a control. This group completed the worksheet referred to in (ii) twice with an eight week gap corresponding to the time taken on the course by the 'A' level/Hospital Services group.

iv. Both researchers were present at all twenty-one sessions and, owing to circumstances, they also acted as tutors for ten of the sessions. All the sessions were taped and notes were made by the researchers on the problems encountered.

d. Findings from the first pilot induction course

i. Features of learning common to all groups

The responses on the worksheets provided insights into students' concepts about learning. For instance, when asked to record what they had learned since birth they mentioned a very wide range of activities, in total 189. Students thought of learning in terms of skills rather than in terms of understanding.

In general there was initially some difficulty in making the distinction between material suitable for memorising and material it is necessary to understand. This was shown in the first session when students were asked to sort cards describing different learning topics into sets according to the ways in which they *could* be learned. The material consisted of examples from the three categories of facts, activities and concepts.

Few students had difficulty in identifying activities, the 'doing' material which is learned mainly by demonstration and practice; but many were confused between material which one memorises in order to reproduce it later in an identical form and material which one needs to be able to understand.

Responses of students on the worksheets provided many examples of the different ways of learning different people employ. For instance, in answer to the question 'How do you learn something new?' twenty-two different ways of learning were suggested and in response to a further question another eight ways were suggested:—

read/study
practise/try out
being told/shown
watching
listening
testing/self-testing
repetition
association
part-learning
questioning
copying
from experience
making notes
feedback/mistakes
experiment/create
problems

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[1] New Opportunities Course: an MSC-sponsored Work Introduction Course for less able unemployed school-leavers. Full-time, one term.

[2] Combined 'A' level and Hospital Services Course: combining academic and vocational studies and possibly leading to higher education. Full-time, two years.

[3] City and Guilds 730 Teacher Training Course: a course for part-time teachers or intending teachers in most cases, with an FE or adult education focus. Part-time, one year.

- rhyming/chanting
- visualising
- simplifying
- meeting people (eg. clubs)
- revision
- repeat actions in mind
- physical guidance
- increasing complexity
- instinct/naturally
- curiosity
- helping
- mental thought
- understanding
- memorising

ii. *Characteristics of the Learning of New Opportunities Group*

Many more of this group were confused about the difference between material which one memorises in order to reproduce it later and material one needs to understand. The kind of difficulty this confusion can cause was demonstrated when they were asked to do some memorising. Half of them reported that they had 'thought about' or 'tried to understand' the items in question, though their ability to memorise similar items improved when they discarded these inappropriate methods for others such as self-testing.

On the other hand, when asked the meaning of understanding all the new opportunity students defined it in terms of 'knowing the meaning'. The consequence of this approach may be that one tends to try to memorise when the need is to understand.

Compared with the other two groups this group listed rather fewer ways of learning when asked to write down *how* they had learned things since birth. Most wrote down the person who had taught them or the place where they had learned and when asked to record the actual ways used to learn nearly half the group said by being told or shown.

Nearly half of the total responses referred to methods which demanded low levels of conscious mental activity. At the start of the course, for example, their most common answer to how they would learn to water ski was that they would join a club, and they wanted to learn chess by being shown rather than by trying to play with someone. When asked how they would teach someone to drive, the most popular responses involved telling and showing; there was little or no emphasis on giving practice, asking questions or telling the learner about mistakes made.

All these responses illustrate two very noticeable tendencies among the New Opportunities Students: a view that teaching and learning are the responsibility of the teacher and a feeling that learning is a fairly passive process as far as the learner is concerned. This may explain the widely used expression 'he learned me'.

It was also noticeable that this group found learning a more stressful activity than did the other students, and being taught an irksome experience. The stress was evident in a mirror drawing exercise, which resulted in students being more eager to finish than to get it right, and in a chinese puzzle exercise in which, having dismantled the puzzle, their inability to reassemble it led to extreme irritation. One reason given by this group for preferring written instructions to a demonstration was because there was no need for a teacher who might become impatient with them.

An interesting contrast with this general feeling, that learning was something externally imposed upon them, was their response when asked to describe something they had found easy to learn. Here they emphasised the things they had taught themselves. When asked to say where they would seek help if they needed it they preferred to get assistance from their peers, by joining a club or by getting their friends to show them. This reaction suggests that it is possible for these 'poor learners' to enjoy learning, and, therefore, to learn effectively provided they can progress at their own rate, be encouraged to take responsibility for their own learning and be provided with a means of correcting their own errors.

iii. *Characteristics of the Learning of the Teachers' Training Group*

The adult group differed sharply from the two groups straight from school in the emphasis they put on motivation as an aid to learning. When asked to note the things they found easy to learn, many mentioned their desire to learn the particular activity as a reason for finding it easy to learn, whereas none within the other groups mentioned this. They also stressed, in defining understanding, the need to know the how and why of a subject before they could assimilate it.

iv. *Changes in student response and achievement*

Comparison of students' answers on the worksheet at the beginning of the course with their answers at the end showed that all three groups were suggesting more ways of learning at the end, including such specific ways as testing and questioning. It might be argued that experience of learning in other parts of their college course could have been responsible for this, but the control group of students listed on average fewer ways after a comparable period.

The students also reported a change in their methods of memorising at the end of the session on this topic. In the case of the New Opportunities students the change to more effective methods was matched by a significant increase in the amount learned, and they were still using the more effective methods a week later when they were given new material to memorise.

At the end of the course the students were asked which learning method they would make most use of in future. In the case of the 'A' level/Hospital Services and Teacher groups a broad range of categories was referred to. In a follow-up questionnaire completed six months after the course had ended 25 per cent of the 'A' level students and 73 per cent of the teachers said they had made use of at least part of the content of the course in the previous six months.

The lecturer in charge of the 'A' level group wrote to the researchers some months later to say that 'students who found your course most useful were the ones (on the whole) who were considered by most members of staff to be lacking in self-confidence. All did better than expected in the end of term test'. At the end of the academic year the 'A' level group sat 'O' level Psychology. Their results were compared with those of the previous year's course and with the control group students. All three groups had been taught Psychology by the same lecturer. The 'How Do I Learn?' group performed markedly better at 'O' level than did the other two groups.

v. *Course acceptability to students in all groups*

If the course seemed irrelevant then we would expect that as it progressed more students would fail to attend, especially the adult evening students who often had to face dark, wet Monday evenings. Attendance did not fall off and all three courses had more than 95 per cent of students present throughout.

Acceptability of the course can also be assessed in terms of the students' interest, views of its usefulness and enjoyment. At the end of the course the students were asked to indicate for each session if they had found it enjoyable, interesting, difficult, useful or boring. On the whole their comments were favourable. As far as enjoyment went, all the groups appreciated the 'learning to do something' sessions most, but the teacher group found the other sessions more interesting. The 'A' level group considered the learning related to their own course to be the most useful. This group was the only one directly involved in Christmas examinations and, therefore, tended to want to concentrate on material they might meet in the examinations. Two of the New Opportunities students displayed a negative approach to most things and despite active participation during the sessions they later claimed to have been bored.

It was encouraging that students felt at least a little more confident about learning something new:

New Opportunities Student

ST 'I will be able to learn much more in the future than I did before. It has been very beneficial. When I have some more exams I shall use your method of reading and understanding. On the whole the course has taught me a lot that I would never have dreamed of.'

'A' Level Students

JC 'I shall make the most of the MUD part, it helps you to think more what different ways of learning there are and then you can choose the one most applicable to the subject.'

TP 'At first when the course started I didn't see the relevance of anything we were doing but now when you had completed the course everything you have done is very relevant. Only at the end can you appreciate everything that has been done.'

Teachers' Training Course Students

SM 'Most sessions were useful and enabled you to see the "act of learning" from other people's points of view so we can realise that we all learn differently.'

DG 'I found the first week difficult because I didn't know what I was looking for, at first, the point that was being made, although it became clear. I enjoyed it all because I had never analysed how I had learnt anything before.'

JN 'I think this course may have been especially helpful to those who have been away from a learning situation for a long time . . . It has certainly enabled me to look at learning from a new angle, however.'

e. Revision of the first pilot induction course

While some of the findings may have implications for teaching and learning in general, their immediate importance lay in their implications for future versions of the induction course. The measures of change in student response and achievement, and their comments on the usefulness of the course, all suggested that the course had been broadly successful in keeping their interest, teaching new learning skills and contributing to the effectiveness of their future learning.

The reactions of the students led to the conclusion that more emphasis should be given to the following points in a revised version of the course:—

1. Learning is something one does for oneself. It is the responsibility of the learner.
2. The most effective ways of learning involve conscious mental activities such as checking, self-testing and questioning.
3. More attention should be given to helping students distinguish clearly between material suitable for memorising and material which needs to be understood.

Other changes were made in response to suggestions made by the pilot course students and tutors on ways in which it could be improved. The researchers' analysis of the worksheets also led to some changes.

It was decided that the next version of the course should be shorter, and it was redesigned around five 2–3 hour sessions.

Those worksheets which had been included as part of the initial research requirement were withdrawn. Others were retained because their use had helped to focus the students' attention, had provided material for discussion and shown the tutor whether or not the students were responding to and understanding the material. These worksheets were, however, simplified, and some other parts of the teaching material were discarded. In some cases clearer examples were provided.

f. The revised pilot induction course

After consultation with College B, agreement was reached to use the revised course with three groups of students.

The first group entered the college from school, to take an Into Work Course.[1] The second group was in employment, Gas Service Engineers on a block-release course.[2] The third group attended the college full-time, the first year of a TEC Diploma in Engineering.[3]

It was intended that each group would have five two-hour sessions, but for administrative reasons the TEC students had nine one-hour sessions instead.

The basis of each course was the revised manual issued to each tutor.

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[1] Into Work Course: an MSC-sponsored Work Introduction Course for less able unemployed school-leavers. Full-time, one term (similar to the course at College A).

[2] Gas Service Engineers' Course: a CGLI craft apprenticeship course. Block-release.

[3] TEC Diploma in Engineering Course: a pre-employment course for engineering technicians, possibly leading to higher education. Full-time, two years.

In addition, with their help, fresh material was developed for each group reflecting the subject matter normally taught on each course.

The researchers visited the college for several meetings with tutors in order to explain the design and purpose of the course and the methods best suited to achieving the course objectives, and in order to prepare appropriate materials. The researchers met the tutors before each teaching session in order to discuss again its purpose and direction, and also to make sure that the necessary worksheets and other materials were available. The researchers attended all the sessions but did not intervene unless asked to do so by the tutor.

g. Findings from the revised pilot induction course

i. *Into Work Course*

This group consisted of 10 students, 6 of whom were said to be unintelligent, in some cases even ESN; all had previously been unemployed, and some were 'known to be trouble makers'.

Before the course began the tutor expressed concern about the capability of this group to cope with the course material, particularly in view of their poor reading, writing and communication skills. She doubted whether the group would concentrate or understand. However, she herself prepared diligently for the course and asked the researchers many questions to ensure that she understood its philosophy and methods.

In general the responses of this group were similar to those of the New Opportunities students at College A. They tended to see learning as something which was imposed upon them, could not easily see the distinction between items for memorising and material which needs to be understood, and defined understanding only in terms of the meaning of words. At first they were also reluctant to work in pairs, to exchange ideas or even to sit close to each other. As the course progressed, however, they showed greater willingness to work together and seemed to enjoy an approach which was very different from the teaching they had experienced previously. They were on the whole capable of dealing with the demands made upon them, and the teacher reported that their interest and motivation were sustained throughout the course.

She was surprised and impressed by how much they had learned. She thought that they had benefited in particular from the fact that everyone's view was taken seriously as a contribution to each problem discussed and not assessed as right or wrong.

By the end of the course students were suggesting more ways of learning for particular tasks than they had at the beginning. This improvement was also shown in the memorising game where on the first trial they mentioned only three ways of learning but on the second nine. Also when learning the colour coding of the London Underground map they suggested six ways, namely association, repetition, self-testing, visualising, listening and looking hard.

Whereas the tutor had initially expressed doubts about the ability of such a group to benefit from the course, she decided subsequently to use it with her next group of 'Into Work' students.

ii. *Gas Service Engineers' Course*

This course was carried out during the students' Industrial Studies period. The learning material was chosen by the course tutor and while there was little difficulty in selecting material for doing and memorising, deciding the content of the section on understanding proved very difficult. Eventually this took the form of the principles underlying the design of hot and cold water storage systems.

Analysis of all the completed worksheets showed that the students responded appropriately to the course material. However, there was very little discussion or feedback facilitated by the tutor in the classroom sessions. This was probably because he was unfamiliar with the content and methods of presentation required by the course.

Comparison of the students' responses on the first worksheet between the beginning and end of the course showed few differences, quantitatively or qualitatively. While their initial responses during each session of the course were appropriate, their ideas were not adequately developed beyond that point, and consequently they gained very little from the whole experience of the course.

iii. *TEC Diploma Course in Engineering*

For a variety of reasons the 'How Do I Learn?' course was abandoned at the tutor's suggestion after four sessions.

While the course had been planned for first year students, the group instructed to take it consisted of second year students who were already familiar with the engineering material used for learning. It had also been scheduled for a seminar session during which it was normal practice for there to be informal comings and goings. The tutor had no contact with the students outside the course and could not consolidate points made during other lessons.

In addition to these difficulties, which made it impossible to run the course properly, the one-hour session proved too short to achieve the required experiences of learning on each occasion. There simply was not enough time for students to reflect upon and discover principles for themselves.

h. Benefits from 'How Do I Learn?' summary

The two versions of the pilot course have demonstrated that the 'How Do I Learn?' course can have four useful outcomes:—

i. There is an improvement in students' confidence in their ability to learn.

ii. Students are able to suggest more ways of learning specified tasks at the end of a course than at the beginning.

iii. Tutors become more aware of the learning methods appropriate to different tasks and how these are relevant to the needs of their students.

iv. Tutors are encouraged to think about learning rather than teaching.

The Implementation of a 'How Do I Learn?' Course

The piloting of a 'How Do I Learn?' course established its value but it also revealed the problems of implementation which have to be confronted if a programme to introduce young people and their teachers to the many ways of learning is to be successful.

It must be stressed that all the tutors concerned were conscientious and cooperative throughout all trials of the course. The difficulties which arose were the result of problems in their understanding of certain aspects of the course philosophy or of the fact that the teaching style required for the induction course was incompatible with their normal teaching methods and to some extent the expectation of their students. There were also some organisational difficulties.

a. Understanding the content

The course required the tutor to be very clear about the concepts and terms used. Any confusion on the tutor's part will obviously lead to confusion in the minds of the students.

Difficulties experienced by some of the tutors included mis-use of terms – for example, talking about repetition when self-testing was meant. One tutor was confused about the distinction between material which needs to be memorised and material which needs to be understood. Yet another asked his students towards the end of the course (by which time it should have become clear that one learns by memorising, understanding OR doing, depending upon what has to be learned) whether *in general* they preferred to learn new material by memorising, understanding or doing.

The tutors who ran the courses with the most satisfactory results were the ones who showed greatest understanding of the course philosophy and who by their questions to the researchers did most to ensure that they did understand.

As a prerequisite, then, tutors must understand the various ways of learning and the research evidence for their effectiveness, the MUD model on which the 'How Do I Learn?' course is based, and the concepts and terms used.

b. Teaching style

The 'How Do I Learn?' course differs in the demands it makes on the tutor as compared with the demands made by a craft or technician course in a number of important ways:—

i. The role of the tutor changes from that of being an imparter of knowledge to that of a facilitator or guide. Tutors must curtail their own contributions and give their students time to learn, discuss and reflect.

It has been demonstrated on the pilot induction courses that between them students were aware of a very wide range of ways of learning. Tutors of future courses should take account of this and encourage students to explore their own ideas, to clarify them in discussion and to relate the ways to appropriate learning material.

Individual differences are to be expected and encouraged, and it is stressed that a way of learning that suits one person would not automatically suit all the others. It is emphasised throughout the course that everyone has something to contribute, no one is right or wrong, and that students are expected to develop an understanding by discussion with their colleagues. Experimentation with new techniques, often suggested by others in the group, is a constant theme.

It is important that tutors must be able to deal with the unpredictability of class responses and to handle feedback from all students.

ii. The craft or technician course has a detailed syllabus on which are based the tests or examinations to which it leads. Tutors are used to judging the effectiveness of their teaching in terms of their students' ability to reproduce accurately material from the syllabus.

By contrast the material on the induction course – whilst it must be appropriate to the needs of the students concerned and at the right level – is not learned for its own sake but is a means of trying out a number of different ways of learning and reflecting upon them. Concentrating on the extent to which students performed a task correctly, to the exclusion of an interest in the ways of learning they used confuses both tutor and student about the course objectives.

iii. 'Questioning' is used on a craft or technician course mainly to ensure that the student has understood meaning or is paying attention. On the induction course questioning is used to encourage students to think about their own experience of learning. Questions are used to help students contribute new ideas and develop concepts, not to check on whether they can reproduce what someone else has just said.

iv. Tutors are accustomed to preventing error whenever possible. While the induction course stresses that immediate correction of error is important for memorising and practice, a different approach is necessary when learning new ideas. Here it is not usually a question of right or wrong, but of encouraging students to consider the implications and explore the logic of different ideas they put forward.

An answer, which might normally be considered wrong, might lead to the development of correct concepts or to the selection of other ways of learning. In learning new ideas and testing them out, error is often a necessary and beneficial ingredient.

v. While the usual practice is to

exhort students to try hard, the weaker ones are often given considerable help and support by the tutor. Tutors tend to want to tell and help at the first sign of problems from the student, rather than hold back and give the student the satisfaction of working it out for himself or herself. The poorer the student the fewer the opportunities are given to learn through his or her own efforts.

vi. At the same time students are often discouraged from helping each other. The consequence of this is that the student becomes very dependent on the tutor. The approach on the induction course should be to resist this tendency. Students should be encouraged to take responsibility for their own learning, should be given plenty of positive feedback and, when necessary, should help each other.

c. Students' expectations

Just as it makes different demands upon tutors, so the 'How Do I Learn?' course makes different demands upon students, some of which go against their normal expectations of what a course should be:—

i. Students expect a recognisable syllabus which specifies an aim or purpose in learning something and establishing how that is to be achieved. They will take some time to adjust to the idea of taking a participative and active role in learning, since much of their past experience will be related to learning by being told by someone else. They are not used to being introspective about their learning.

ii. Students must be reassured that they are learning things not for the sake of it but in order to study HOW they learn. They will be inhibited if they believe that a worksheet is to be marked for errors of spelling or grammar, or if one of their ways of learning is to be deemed incorrect. A way of learning cannot be incorrect if selected by a student, though he or she might decide to change it for another way later.

iii. Some students, particularly the less able, are fearful of giving their views in class in case they are ridiculed, by the tutor or fellow students. They may often ask the tutor to read what they have written on their worksheets rather than publicly state their ideas. Less able students need longer sessions to adjust to giving their own views and ideas. They need time to get used to the concept that they are responsible themselves for what happens during the sessions of the course; and they need more time for consolidation of what they have learned.

iv. Students are often reluctant to work in pairs or to help each other. They are used to tests, for example, where individuals are being assessed against some norm or each other and are at first reluctant to share knowledge.

d. Organisational support

The successful development of a programme focused on the 'How Do I Learn?' course requires the support of the organisation, whether a college or training establishment:—

i. Courses will be successful only if the tutor understands the ideas involved in the course, is able to adopt a suitable teaching style and understands the expectations of the students. For this reason the researchers strongly recommend that tutors who wish to run the course should be given appropriate training in advance.

Their training should take the form of a 'How Do I Learn?' course which is run specially for them. This is because the advantages of experiential learning apply as much to teachers as to anyone else. In fact in their case it is more than usually appropriate: having been on the receiving end of the course themselves they would be better able to appreciate the needs of the students they subsequently guide on similar courses.

ii. Tutors will require time for the selection and preparation of material for the course. The pilot manual suggests MODELS but no more. The production of appropriate materials to develop understanding through problem-solving for particular groups of students is both difficult and time-consuming. The training period could also be used, where necessary, to help tutors prepare new learning materials where they are needed, but many will need additional assistance and support.

iii. The production of sets of materials for a class can be a problem, particularly where special materials, tools or parts are required by tutors who do not normally make such requests. Tutors may have to borrow things from other sections of their establishments, with all the difficulties that this sometimes implies.

iv. Comments from both students and tutors showed the desirability of incorporating the induction course into each group of students' main course of study. In this way the tutor would be able to illustrate the learning methods explored on the induction course with appropriate examples from the students' main study material. The tutor would also be able to make sure that the students practised and consolidated their new ways of learning throughout their course. In order for this to be done satisfactorily it would be essential for the tutor to be familiar with and understand all the ideas and methods used on the 'How Do I Learn?' course; but it would also be of value if all tutors involved with a particular group of students were aware of their potential role in reinforcing the messages of the course in their own teaching.

v. The time allocated to each of the sessions of the course is very important. There has to be sufficient time to allow for experience of different ways of learning to occur and for reflection through discussion to take place. It is not possible to run the course satisfactorily in one-hour sessions. A minimum of two hours per session is required.

To repeat, this project represents an experimental programme. It should not be assumed that conclusions have been firmly reached, materials exhaustively tested or techniques well established.

There are difficulties with regard to implementation in the tutor's understanding of the nature and content of the programme; and in their adoption of an appropriate teaching style, a style which may be very different from their usual one. Students may begin with a set of different expectations about the nature of learning and the role of the tutor. There may be problems in introducing and interpreting the programme in situations in which tutors feel themselves constrained by lack of time and resources. Organisational support – staff development, time and resources – is required.

There is, however, evidence of the effectiveness in terms of improved student learning of a 'How Do I Learn?' course particularly in mainstream education and training programmes. What is needed is further development and experimentation. The researchers would like to invite teachers and trainers to proceed further with the assurance that the researchers would welcome feedback from them. For their own part the researchers will continue to develop their own work in this area.

CHAPTER 4

'HOW DO I LEARN?'—A MANUAL

AND EXAMPLES OF TEACHING MATERIALS

How Do I Learn?

Introduction

The 'How Do I Learn?' course is the outcome of a project which was commissioned by the Further Education Curriculum Review and Development Unit and which was undertaken by the Industrial Training Research Unit, Cambridge. The starting point for the project was the belief that many young people learn less effectively than they might, and that it should be possible to help them learn more efficiently and with more confidence and enjoyment. A summary of the aims of the project includes the following:—

> 'To prepare young people for their future learning by helping them to identify their own learning difficulties, by giving them the opportunity to try out different ways of learning and, where necessary, giving them practice in specific learning techniques.'

A pilot course which was intended to fulfil these aims was carried out in two colleges of further education. One outcome of those pilot studies was the accompanying course manual as well as a number of important recommendations about the way in which the manual should be used. This introduction explains the thinking behind the manual and describes the teaching approach which should be followed to enable the students to gain the maximum from the course content.

Course objectives

The course objectives are based on two important observations about the ways in which people learn. The first is that there are more, and less, appropriate ways of learning any given task or skill. One measure of the ability to learn effectively is the extent to which appropriate rather than inappropriate ways are used for any particular purpose. The second point is that the range of methods used by an individual, even when they are appropriate, may be rather narrow. Other relevant ways, of which the individual is unaware, may be of assistance to learning if the person can be helped to acquire them.

It is not difficult to illustrate the point that some ways of learning are more appropriate for their purposes than others; for instance, if one wants to learn to ride a bike, practice is essential. Learning about how a bike is made and how the parts work would help for the purpose of maintaining the bike; it would not help one to acquire balance. Such distinctions are not, however, always so clear, especially to people whose record of learning ability has hitherto been poor. The less academic students on the pilot courses, for instance, tended to think of learning simply in terms of memorising and could not identify the kind of material it was necessary to understand. A contrary instance is the person who, instead of concentrating on memorising something he has been asked to learn off by heart, continues to concern himself with the theory behind it all. One aim of the course, therefore, is to communicate some of these distinctions, so that students can observe them in practice.

The other aim is to give individuals greater awareness of the range of appropriate methods they might use in relation to the type of material to be learned. While many students put a lot of stress on the importance of memorising, their way of doing it may be confined to 'staring at' or 'thinking about' what they have to learn. Learning how to test themselves, how to make connections between items which must be memorised, or how to create a mnemonic, are all methods which can improve their ability to memorise. In the case of learning how to understand, practice of different ways also has the important benefit that students better appreciate what is involved in understanding something. Poorer learners are likely to think that understanding is simply a matter of 'knowing what it means'; by trying out problem-solving and questioning techniques they begin to realise that understanding also involves making connections among ideas or putting a new piece of information into a context.

How students learn on the course

The previous section summarised very briefly what students should get out of the course. This section describes how students should be helped to acquire a wider and more appropriate range of ways of learning as the course progresses.

The difficulty which faces you, as a tutor, is to help students acquire understanding and expertise on subject matter which, if summarised in a few words for the students' benefit, would sound abstract, probably very difficult, and in most cases remote from their interests. The solution lies in making the course as *practical* as possible. What this means is that students try learning a series of tasks – the nature of which is explained in the course manual. They are then asked to think about how they proceeded. Finally at the end of group discussion, and under your guidance, they arrive at conclusions about the nature of the learning in question and the kind of ways which are appropriate for it.

The course manual provides the structure for the course and thus for the various experiences of learning in which the students take part. The learning materials provide the substance for those experiences. The tutor's role is to work through the structure and the materials so that the course is properly organised, to encourage the students to express their ideas, and to act as discussion leader so that individuals can be helped to reach conclusions. It was evident on all the pilot courses that the poorer learners were those whose approach to learning was very passive. They did not take responsibility for their own learning. More successful learners are much more active in their approach: they ask questions, make suggestions, and experiment with ideas. One of the consequences of working on the learning tasks included in the course material is that learners come to adopt a more active and exploratory approach to learning. Thus an important aspect of your role is to encourage activity and participation on the part of the students. The more they participate the more they will gain from the course. What you must avoid is telling them what's what or lecturing them, as this will reinforce the poorer learner's idea that you, the teacher, are the source of all learning and there is nothing they can contribute. While it is crucial that you structure the sessions and lead discussions so that everyone is encouraged to contribute, it is equally important that the students do *not* see you as an exclusive holder of expertise. Given the right encouragement from you they can discover they are capable of developing ideas for themselves – through trying out and reflecting upon different ways of learning.

How learning is categorised

The course deals with three broad categories of learning: Memorising, Understanding and Doing, which can be represented by the mnemonic MUD.

Memorising

This is used for material which has to be reproduced after a period of time without alteration. Examples are dates, technical terms, names of people and places, poems and telephone numbers. Students first use their usual ways and are then encouraged to try different ones from the many methods available, eg. linking, grouping, self-testing, and part-learning.

Understanding

This category covers all learning in which it is necessary to see the relationships between different ideas and in which it is necessary to apply general principles. The material dealt with in this introduction is an example.

In order to improve their ways of understanding students are asked to develop their ideas by comparing and contrasting similar activities which they already know about; they are asked to work in pairs to solve problems; and they are asked to formulate questions as a way of expanding their ideas on subject matter which is familiar to them.

Doing

This category covers learning tasks in which physical activity and practice play a significant part. Manual skills of all kinds fall in this category and examples are sewing, drilling, sawing, jumping and bowling. The procedural aspects of doing – proceeding with different parts of the task in the right order – are evident in many of these tasks.

During the course, students experience ways of learning to do something, by following a demonstration, by following written instructions, and by *un*doing – taking apart a completed product in order to see how to put it together.

Timetable of course

For several reasons, it is suggested that you run this course only for students you will be teaching during other parts of their main course. If you teach the students subsequent to the 'How Do I Learn?' course you will be able to help them apply what they have learned and thus be sure that their main subject learning is improved. Through running the 'How Do I Learn?' course you are likely yourself to discover quite a lot about your students, their preferred ways of learning and their difficulties. This knowledge will be of benefit to you as a teacher and to them as learners. It will be easier for you to provide relevant examples of learning material for the 'How Do I Learn?' course – where necessary – if you are familiar with what they have to learn on their main course.

Clearly students will benefit most from the course if it is given when they first join the college. If this is not possible it would be worthwhile at the start of a new course which you will be teaching them.

Experience on the pilot courses showed that it is necessary to timetable five sessions of at least two hours each including a break. Periods shorter than two hours will be insufficient for trying out, reflecting upon and discussing the variety of different ways of learning covered by each session.

The pilot courses were run for the following groups of students:—

Students of New Opportunities Programmes (2 groups);
Combined 'A' level and Hospital Services students in their first year;
Gas Service Engineers, City and Guilds;
Teachers' Training Course, City and Guilds, part-time.

These courses cover a very wide range of interest and ability, and there is no reason in principle why 'How Do I Learn?' should not be given for any course in the further education curriculum. The only proviso is that for certain parts of the course it is essential for the learning material to be relevant to the students in question, both in its subject matter and in its level of difficulty.

Each of the pieces of learning material which accompany the manual has been designed with one of the above groups in mind. Thus if you wish to give the course to a group of students whose main subject of study is different from any of those groups, or who are doing more, or less advanced work, even in the same subject, it will be necessary for you to select alternative learning materials for all those tasks which are marked thus: ★ in the material needed for each session.

Preparing for the course

The best possible way of preparing for the course would be to take part in it yourself as a learner on an in-service training course.

The reasons for doing this are that the teaching method required for the course to be a success is in several important respects very different from the approach which is usually used on FE courses. Acting as a student under someone else's direction will also be beneficial because that will give you the opportunity to understand how a course of this kind works for the learner. In particular you will have the opportunity of discovering for yourself how the main ideas underlying the course emerge from the experience of doing the various learning tasks it involves.

students it would be advisable for you to use these first on a trial basis with a colleague or a comparable group of students. This will enable you to discover and iron out any problems which the first draft of the material presents. It is important that you are confident about all your material when running the course.

Some do's and don'ts

The following points are based on the experience of the teachers who took part in the pilot courses and which they considered would be valuable to anyone else running a 'How Do I Learn?' course.

DO concentrate your own attention and that of the group on *how* they learned any particular task and consider successful efforts entirely in terms of how they were achieved.

DON'T draw attention to who did well or badly on any given task, and praise or blame students accordingly. This is not the point of the exercise and will alienate those students you most want to help.

DO judge the success of each session in terms of how many different ideas and suggestions were put forward by the students, of how many students contributed to the discussion and to what extent the students, rather than you, were able to express the main points which were learned from it.

DON'T judge the success of each session in terms of how much of the learning task the students were able to perform well. The learning materials are only a means to the end of discussing learning methods; they are not there to be learned for their own sake.

DO question students individually to find out how they went about different tasks and what their ideas are.

DON'T question students to find out whether they have followed what the teaching material says, what you said, or what another student said. You want to discourage rote learning or repetition of other people's ideas.

DO encourage students to explain their ideas even if something they say seems to you to be incorrect. Find out why they hold that opinion and then ask other students to comment. Through discussion it should be possible to disentangle any misconceptions and thus to deepen the understanding of everyone concerned.

DON'T tell a student his or her answer is 'wrong' and then try another student for the 'right' one. This will make students think that you are the only expert on the subject and encourage the kind of passivity which the course is intended to counteract. All contributions should be welcomed and considered.

DO encourage students who say they are finding a task difficult to try again – without your assistance – and to work together to overcome problems. This will encourage them to be more resourceful and help them to see that, even if they cannot cope with a difficulty unaided, by working together they can achieve their goals. The very process of working out a solution will also improve their learning ability.

DON'T rush in to rescue any student who is finding the going tough. Do as suggested above and thus prevent that student from becoming dependent on you.

DO try out the material once you are confident you have understood it and know how to lead students through it.

DON'T be discouraged if you experience some difficulties first time round.

How Do I Learn?

Course Manual

		Page
Session 1	Introduction. Relating what is learned to methods of learning. Development of a simple framework for categorising material into facts, concepts and activities, learned by Memorising, Understanding and Doing respectively.	24
Session 2	Learning to Do something. Experience of learning from a demonstration, written instruction and by *un*doing.	29
Session 3	Learning to Memorise something. Experience of memorising and trial of different methods.	35
Session 4	Learning to Understand something.	41
Session 5	Revision of Learning methods.	46
Examples of materials.		48

Notes

1. Although the Pilot Courses ran for two-hour sessions, we recommend that each session should be of three hours, including a half-hour break if this is possible. The course cannot be run in one-hour sessions.

2. If possible we recommend that Sessions 2, 3 and 4 are consolidated in further sessions using material from the students' syllabus. In addition, when students are introduced to new learning material in their main studies, the tutor should remind them of the various strategies which are appropriate.

3. Material to be used on all courses is incorporated in the manual. Where extra material specific to the students' curriculum is needed this has been indicated *. Material which has already been used on other courses is given at the end of the manual to act as examples.

4. The purpose of the worksheets is to help students to clarify and record their ideas to aid in group discussion. They are not for marking.

Material needed for each session

		Page
Session 1	Copies of Worksheet A for each student. Pack of cards, sufficient for one pack to each two students.	26
Session 2	Copies of Worksheet B for each student. *Two tasks to learn from written instructions. *Written instructions and materials for each task sufficient for half the class. *Task for learning by *un*doing, sufficient for half the class. Handouts on Doing.	32
Session 3	Copies of Worksheet C for each student. Twenty-four items for Kim's Game 1. Thirty-six items for Kim's Game 2. Scrap paper. Handout on Memorising. Stop watch or timer. Cloth to cover items. *Memorising task from students' syllabus for self-testing, associations, part-learning, etc.	37
Session 4	Copies of Worksheet D for each student. *Problems for the students to solve and elicit concepts and/or essay topics involving understanding.	43
Session 5	*A memorising task. *An understanding task. *A task for the tutor to demonstrate.	46

* Examples of these tasks or materials are provided at the end of the manual. If suitable for the students in question they can be used as they stand. If not, equivalent tasks or materials should be designed to meet the interests and ability level of the particular group of students.

Introduction to 'How Do I Learn?'

Objectives

1. To make students realise that everyone can and does learn.

2. To make students think about the ways of learning they normally use.

3. To emphasise that the course is about HOW they learn. The material to be learned will be, where possible, relevant to their studies but it is the examination of METHODS of learning that is important.

4. To introduce students to thinking about learning in terms of:
   - – learning in order to *M*emorise
   - – learning in order to *U*nderstand
   - – learning in order to *D*o something.

5. To introduce students to the idea that there are a variety of ways of learning appropriate to each of these categories and that, within each category, they may find that some ways of learning suit them better than others.

Content and Purpose	Method and Materials
1. Introduction to course. To draw attention to:— – the HOW of learning – INDIVIDUAL differences in learning	Students are told that:— (i) Although the sessions use material relevant to their study, the course is about LEARNING METHODS. They will be mainly looking at HOW they learn. The course is to help them in their future learning. We want them to examine their own methods and try new ones so that they can see what is most helpful to them as individuals. (ii) They will be asked to do various things, make some notes on worksheets and then discuss their findings with the whole group. (iii) During the first session they will be thinking about things they have already learned and how they learned them. They will then group learning material according to the way in which it is learned. Later sessions will cover the different methods of learning.
2. Methods of learning experienced by students. To emphasise the centrality of learning in their lives.	(i) Give out Worksheet A and ask students to list on it twelve things they have learned since they were born and how they learned them. Tell the students to fill in ONLY those columns headed 'Things I have learned since I was born' and 'How I learned them'. **Note:** While the students are filling in the forms DO NOT draw attention to the differences between HOW they learn and WHAT and WHERE they learn.

Content and Purpose	Method and Materials
To clarify that the course is about HOW they learn. To stress that learning is something *they* are actively involved in.	(ii) When students have finished filling in the worksheet, tutor starts a group discussion on responses. **Note:** The emphasis should be on HOW – meaning method – and not WHERE learning took place or WHO the teacher was. In the majority of instances the responses will have been in terms of WHO and WHERE; the discussion, therefore, will highlight the concept of HOW they learned things. Some learning methods may be categorised as 'instinctive' or 'natural', eg. walking. It can be pointed out that learning to walk also involves practising, copying or imitating and trial and error. First list all methods mentioned by students and then using check list on page 27 suggest additional methods. Explain the difference between methods of learning and who or what we learn them from; eg. teacher, TV. (iii) Students write on Worksheet A, page 26 the additional methods which have been mentioned and which they think would be relevant to their learning.
3. Grouping of Learning Material by HOW it was learned. Students work in pairs. (This helps to stimulate discussion.) The cards are used to help the students discover for themselves how to group learning into three categories – facts which are *M*emorised, concepts which need to be *U*nderstood and activities which are learned by practice and *D*oing.	(i) Students work in pairs. Each pair is given a pack of 30 cards (see page 28) and asked to sort them into three groups according to what they had to do, or would have to do, to learn the item on the card. (ii) When all the cards are sorted, the students list in numerical order on Worksheet A the cards in each group. They then name the main kind of learning methods for each group. (iii) Tutor asks each group the method of learning card 4 – Playing football – and lists method on board. List and state other cards given by students in this group. Get group to discuss differences. Tutor asks each group the method of learning card 29 – Telephone numbers – and again lists methods on board, and discusses other material learned by this method. Discuss discrepancies. List methods suggested for the remaining cards and deal with in a similar way. (iv) Discuss and gradually bring out the idea that learning can be related to facts, ideas and activities – MUD.
4. Practice in MUD classification in order to ensure that the concept has been grasped, and to reinforce it.	(i) Give them a few minutes to relate MUD to their own lists of things they have learned (Worksheet A, page 26). Go through their lists with them. **Note:** This will be a good opportunity to show that a great deal of learning involves memorising, doing and understanding; and the various parts are tackled by different learning methods, eg. in learning to drive we practise gear changing, memorise the Highway Code and understand road behaviour through problem solving.
To show the relevance of the 'How Do I Learn?' course to their syllabus.	(ii) Relate the MUD classification to the students' own course material. Ask them to talk about the kinds of things they have had to learn and will have to learn and discuss how they did or would learn them.

'How Do I Learn?'

Worksheet A

Name .... Date .... Course ....

	Things I have learned since I was born	How I learned them	Other methods after class discussion
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Please write the card numbers in each group: then write a name or description of the method of learning each group.

Group 1	Group 2	Group 3

Name of method ____________________ Name of method ____________________ Name of method ____________________

‘How Do I Learn?’

Check list of METHODS of learning

Association
Chanting
Copying
Discussion
Doing
Feedback — positive and negative
Grouping
Linking and relating
Part-learning
Practice
Questioning
Repetition
Self-testing
Testing
Trial-and-error
Watching

Learning MEDIUM

Teachers
Parents
Friends
Books
TV
Films

'How Do I Learn?'

Details of cards and their classification into MUD

D	M	U
4 Playing football	2 Names of flowers	1 Predict the weather
6 Walking	8 Capital cities	3 How an engine works
11 Swimming	13 Dates in history	5 Why people get fat
12 Cycling	14 Poems	7 Why towns are formed
17 Jumping	16 Multiplication tables	9 Why we have laws
19 Horse riding	18 A mathematical formula	10 Why Australians don't fall off the earth
20 Dancing	21 Kings and Queens of England	15 What is gravity
23 Tie shoelaces	24 Alphabet	22 How we digest our food
28 Dressing	27 Time tables	25 How aeroplanes fly
30 Diving	29 Telephone numbers	26 What causes earthquakes

Name of method

Examples of student responses:

Practising	Repetition	Questioning
Doing	Memorising	Asking
Trial-and-error	Chanting	Discussion

Learning to Do something

Objectives

1. To get the students to think about the different ways of learning to do something.

2. To introduce students to three ways of learning to DO something:—
- learning from written instruction
- learning from a demonstration
- learning by *un*doing.

3. To enable them to consider the advantages and disadvantages of these methods in general, and in relation to the task.

Content and Purpose	Method and Materials
1. Reinforcement of MUD and identifying those activities we learn to *do*. Relate MUD classification to students' studies.	(i) Ask class to recall the three groupings of methods of learning and the mnemonic from the previous session. (ii) Ask for examples of things that have to be memorised, understood and done, in order to check understanding. Discuss new material learned during the week and relate it to MUD. (iii) Point out that this session is concerned with activities, learning to DO something.
2. Learning to DO something – Methods. To show that most 'doing' involves a *P*urpose to be understood, a *P*rocedure to be followed and physical and perceptual aspects which need to be *P*ractised.	(i) Point out that learning to do something normally involves:— *Purpose* – some understanding of what you are trying to achieve; *Procedures* – or rules, and *Practise* (see hand-out on page 33). (ii) This session will concern various ways of learning the procedures for doing something. (iii) Tell students that when learning the procedure it is important to avoid errors, as unlearning can be difficult. When the procedure is mastered then practice can begin. (iv) Outline the three main ways of learning procedures:— – from written instruction – from a demonstration, and – by *un*doing (disassembly)
3. Experience of Learning to DO something from written instructions. To encourage students to learn a skill thoroughly. To make students think of learning from the teacher's viewpoint.	(i) Class is divided into pairs. Hand out Worksheet B (page 32) to each student and written instructions for one *Task 1* and one *Task 2* to each pair. (See page 48 for examples.) **Note:** Students individually learn a skill but one of each pair will be learning *Task 1* and the other will simultaneously be learning *Task 2*.

Content and Purpose	Method and Materials
Writing down helps to clarify the students' ideas and leads to better group discussion.	(ii) Make it clear to the pairs of students that they will later be required to teach each other by demonstration, what they have learned and that the written instructions will be taken away. They can make notes if they wish. **Note:** If the tasks are assembly tasks check each piece is present before the session begins. If students finish the task quickly get them to take it apart and do it again. (iii) When students have finished the first task, ask them to fill in the first part of Worksheet B (page 32), ie. Advantages and Disadvantages of written instructions.
4. Learning to DO something from a demonstration.	(i) Working in pairs, one from each pair teaches the other by demonstration. (ii) After the first person in each pair has demonstrated the task and the second person has mastered it, the second person teaches the other task to his/her partner. (iii) Ask the class to make notes on the second part of Worksheet B, ie. the Advantages and Disadvantages of learning from a demonstration.
5. Comparison of learning from written instructions with a demonstration. To clarify the students' views on the two methods of learning.	(i) Encourage class discussion on their findings. (ii) List on the board advantages and disadvantages noted by the group. **Note:** Elicit all the advantages and disadvantages of the two methods from the students in class discussion before adding from the list below. **Written Instructions** Available for reference Work at own speed Can do on one's own Can easily repeat Can be misleading or difficult to understand No one available to ask questions No one available to give feedback Give the impression it's more difficult than it is **Demonstration** Can see final result Easier to understand when you see it being done Can ask questions Can get immediate feedback Could be a poor demonstration Demonstration could be too fast After demonstration, nothing to refer to.

Content and Purpose	Method and Materials
6. Further trial on the skill originally learned from written instructions. To let students see how teaching a skill may aid learning.	**Note:** If an assembly task with a largely procedural content has been used, a further trial may be unnecessary, and this and the following section omitted. Where the task is such that practising it is likely to improve performance, further trials could be of advantage to students if time is available. (i) Ask each person to practise the task that was originally learned from written instructions, and which has subsequently been taught by demonstration to the other person in the pair. (ii) After the practice lead group discussion to find out any benefit students found from teaching the skill. **Note:** Many find that teaching a skill to someone else improves their own level of skill.
7. Further trial on the skill originally learned from demonstration.	(i) Tell students to practise the skill they were taught by demonstration. (ii) Lead group discussion on findings. **Note:** Some may find is easier because they have done it before; and others more difficult because learning another skill may interfere with learning the new skill.
8. Learning by *un*doing or backward learning in order to understand the problems and how to overcome them.	(i) Give each pair of students an assembly task (for example, see page 58). (ii) Tell the students to take it apart and fit it together again correctly. **Note:** No hints or advice are to be given on how to do this. (iii) When students have completed the task, lead a group discussion on the various methods adopted. **Note:** A few suggestions may be given to the group if they do not arise spontaneously from the discussion, eg:— 1. Lay out pieces methodically. 2. Create your own flow diagram. 3. Introduce cumulative part method, ie. take one piece out and replace it; take two pieces out and replace them: when this is mastered, take three pieces out and replace them; and so on.
9. Summary of learning to DO something.	(i) Give out and discuss handout on 'Learning to DO Something', pages 33 and 34. (ii) Ask students to note on their handout any points about their own experiences of learning to DO something.

'How Do I Learn?'

Worksheet B

Name .... Date .... Course ....

Comparison of Learning from Written Instructions with Learning from a Demonstration.

	Advantages	Disadvantages
Written Instructions		
Demonstration		

Learning to Do something

Hand-out

Learning to Do something normally involves:—

some understanding of what you are trying to achieve, eg. to get the ball into the net	– *P*URPOSE
some procedures or rules to memorise, eg. the off-side rule	– *P*ROCEDURES
some manual skills or reflex skills which you need to practice, eg. kicking a ball.	– *P*RACTICE

The practice part is very important and you must always try to get the movements RIGHT from the start, even if it means doing something in slow motion.
UNLEARNING can be difficult.

You must not be surprised if you get to a stage where you don't seem to improve much – a LEARNING PLATEAU. When you START you need to memorise and understand. As you get better, you forget all about the memorising and understanding and do things automatically and this is how you 'get off the plateau'. This is often the stage when you are unconsciously learning to use information from muscles as well as from your eyes and ears. Using this muscle information is much quicker than using other cues. Once you have learnt it you will start to improve and often find you can do things without thinking.

Learning from a demonstration

WATCHING SOMEONE:—

WATCH carefully – notice: body movements, *which* hand and foot is being used; *when* sight, sound, smell or touch is involved; *how* tools and materials are held; and
ASK QUESTIONS until you know what is being done.
Try to find the KEY POINTS in the cycle which might cause particular difficulty.
If the sequence is long or fast try to break it up into parts and jot down the order of movements.
Look out for INSPECTION CHECKS and memorise them.

BEFORE YOU TRY:—

MENTALLY go through the sequence; use your notes.
GET THE FEEL of the materials and tools you will use.
DECISIONS often need to be made. Make sure you know when to make them.
Consider whether there are any points where you need to do two things at once.
Remember that it is important to be aware of any danger points and any safety precautions.

WHEN YOU START:—

Try to start as soon as possible after watching someone or being shown.
Concentrate on doing the key points slowly before you attempt to speed up.
DON'T HURRY at the beginning. It is more important that you GET IT RIGHT.
Once you've learned something wrongly it is often difficult to correct it.
PRACTISE as OFTEN as you can, especially in the beginning.
Learn until the movements become AUTOMATIC.

Learning from written instructions

READ right through carefully before you start. Be sure about what your objective is and what you are trying to do.
CHECK that you have all the materials and tools you need.
LOOK very carefully at any diagrams, especially those that give names of parts and indications of different stages in the process.

Learning from *un*doing

LAY THE PARTS OUT systematically in a row, or number them as you remove them. If what is to be learned is not in parts but continuous, eg. macramé, undo one section only and re-do. Repeat until you have learned this section, and then undo the second section. Then re-do two sections. Continue in this way until you are able to do, undo and re-do all sections.
IF YOU UNDO TOO MUCH YOU WILL BE LOST.

Learning to MEMORISE something

Objectives

1. To get students to consider the different strategies they use for remembering.
2. To introduce the students to alternative strategies and to encourage them to try them.

Content and Purpose	Method and Materials
1. Review MUD concept and learning to do something and introduce memorising.	(i) Ask class to recall the three groupings of methods of learning, ie. MUD. (ii) Revise Learning to Do something – *Purpose* of learning, *Procedures* and *Practice* – (3Ps). Emphasise the importance of not making errors in the early stages of learning a procedure. (iii) During this session they will be trying out different ways of memorising.
2. Memorising. To get them to think about the methods of memorising they normally use.	**Note:** In order to look at individual differences in memorising, Kim's Game is played twice. This game involves memorising a number of articles in a limited period of time. For *Kim's Game No. 1* 24 objects are spread out on a central table and covered with a cloth before class starts. For suggested articles see page 38. Give out Worksheet C, page 37. (i) Tell students they have two minutes to learn the objects on the table under the cloth. (ii) Take off the cloth and quickly identify each object to the students. (iii) After two minutes cover the articles with a cloth, and ask students to write down as many objects as they can remember on their worksheet. Also ask them to write down on Worksheet C how they memorised the objects.
To introduce students to other methods of memorising.	(iv) Do not collect individual scores. Find out who had more than 20 correct, and ask these students what methods they used to memorise the objects. (v) List the methods mentioned, adding additional methods given by the rest of the group. Ensure that all students give their methods. Compare the total list obtained through discussion with the list of common aids in the handout on Memorising, pages 39 and 40. Any methods not mentioned by the students can be discussed.

Content and Purpose	Method and Materials
3. Memorising with self-testing. To let them assess the effectiveness of self-testing. To encourage them to use other methods.	(i) Explain that self-testing is one of the most effective methods to use when memorising. (ii) *Kim's Game No. 2.* For suggested articles see page 38. Tell students they will have three minutes to learn the objects. After each minute the objects will be covered and they will write down what they can remember. The first two trials will be written on scrap paper which will be removed after each attempt. Their third attempt will be written on Worksheet C. (iii) After this process ask the students to write down the methods of memorising they used. (iv) Show the students the objects and ask them to check their own responses against the articles. (v) Ask for the methods used by those with the highest marks. Note these methods and then ask for additional methods from the rest of the group. Discuss the methods with the group and the effect of self-testing.
4. Consolidation of memorising methods. Introduction of the idea of using *mentally active* learning methods.	(i) Give out a memorising task related to their syllabus. (See page 59 for examples.) Allow 5 minutes to memorise it. Then ask the students to mark their work and then discuss methods of memorising used. Emphasise the value of *self-testing,* a mentally active method, rather than *copying,* a mentally passive method.
5. Special aids for memorising. To introduce other memorising strategies which are appropriate for long-term recall.	Give out handout on Memorising (pages 39-40) and introduce and discuss the special aids. **Note:** To help consolidate these special aids, think of some examples related to the students' course or interests.
6. Practice of special aids to memorising. Making up a mnemonic.	(i) Discuss the Conditions for Good Recall listed in the handout. Encourage students to memorise the conditions by making up a mnemonic. Tell the students they can, if they wish, work in pairs and that they have five minutes. When the five minutes is up ask for the mnemonics. (ii) Discuss with students the effectiveness of mnemonics and problems involved.
7. Individual differences in memorising strategies. To try and help them identify whether they are visualisers or verbalisers.	(i) In order to identify students who are verbalisers or visualisers, tell the students to think of a telephone number they know well. (ii) Note on the board how many are hearing it and how many are seeing it written down. (iii) Suggest they make use of their best method of recall when they are memorising. (iv) Ask the students to add to the handout any points about their own best learning methods and whether they are a visualiser, verbaliser, or both.

'How Do I Learn?'

Worksheet C

Name .... **Date** .... **Course** ....

1. Kim's Game No. 1. Please write down the objects remembered.

1 ____________________
2 ____________________
3 ____________________
4 ____________________
5 ____________________
6 ____________________
7 ____________________
8 ____________________
9 ____________________
10 ____________________
11 ____________________
12 ____________________
13 ____________________
14 ____________________
15 ____________________
16 ____________________
17 ____________________
18 ____________________
19 ____________________
20 ____________________
21 ____________________
22 ____________________
23 ____________________
24 ____________________

TOTAL CORRECT ________________

2. How I memorised

____

____

____

____

3. Kim's Game No. 2. Please write down the objects remembered.

1 ____________________
2 ____________________
3 ____________________
4 ____________________
5 ____________________
6 ____________________
7 ____________________
8 ____________________
9 ____________________
10 ____________________
11 ____________________
12 ____________________
13 ____________________
14 ____________________
15 ____________________
16 ____________________
17 ____________________
18 ____________________
19 ____________________
20 ____________________
21 ____________________
22 ____________________
23 ____________________
24 ____________________
25 ____________________
26 ____________________
27 ____________________
28 ____________________
29 ____________________
30 ____________________
31 ____________________
32 ____________________
33 ____________________
34 ____________________
35 ____________________
36 ____________________

TOTAL CORRECT ________________

4. How I memorised

____

____

____

____

Suggested items for Kim's Games

No. 1 (24 needed)

paper
envelopes
pencil
pen
ruler
ink
chalk
cloth
stapler
folder
box
book
label
rubber
keys
wallet
scissors
calendar
diary
cellotape
nail
screwdriver
pliers
hammer
spanner
protractor
pencil sharpener
glue
compass
set square

No. 2 (36 needed)

torch
comb
brush
flannel
soap
towel
knife
fork
spoon
washing powder
scrubbing brush
nail brush
sponge
match box
knitting needle
cup
saucer
plate
jug
bowl
toothbrush
mirror
penknife
ash tray
vase
plant
coat hanger
belt
sock
egg cup
wooden spoon
string
peg
paint brush
scarf
reel of cotton
ball of wool
cotton wool
paper hankies
batteries
toothpaste
bottle
candle
light bulb
flex
lighter

Memorising

Hand-out

Common aids

I Association

Verbal

(a) GROUP things together, eg. it costs the same to send an airmail letter to Argentina, Canada, Kenya and South Africa
(b) PAIR things, eg. knife and fork
(c) LINK with things you already know, eg. Brighton is in Sussex, Worthing is near Brighton, so also in Sussex.
(d) Make up UNLIKELY ASSOCIATIONS, eg. chalk and cheese.
(e) Make up a story linking things together.

Visual

(a) GROUP things together and visualise them.
(b) VISUALISE THE LOCATION, eg. imagine opening the pantry door and seeing the things on the shelves to remember what food to buy.
(c) Write a list and visualise it.

II Repetition

(a) *Written* WRITE OUT a number of times, eg. spelling mistakes.
(b) *Verbal* REPEAT ALOUD a number of times, eg. poetry.
(c) *Aural* LISTEN several times to a tape or record.
(d) *Visual* READ over and over again.

III Self-testing

Used in combination with REPETITION is particularly helpful.

IV Part-testing

If there is a lot to be learned, break it down into parts. Learn each part thoroughly before going on to the next part. For older learners, it is helpful to revise the first part while learning the second part (CUMULATIVE PART-LEARNING). Test yourself on the first two parts before going on to the next part (PROGRESSIVE PART-LEARNING). Learning all the parts separately before testing yourself (Pure Part-Learning) IS NOT a good method.

Special aids

I Rhyme rules

For example, to help to remember the number of days in each month.

"Thirty days hath September,
April, June and November, etc."

II First letter mnemonics	For example, to learn the colours of the spectrum. Red, Orange, Yellow, Green, Blue Indigo, Violet, ROYGBIV. Richard of York Gained Battles in Vain.
III Number rhyme systems	First memorise associations between numbers and rhyming objects, eg. one – bun, two – shoe, three – tree. Then form unusual associations between the things to be remembered and the rhyming objects, eg. if objects to be remembered are piano, daffodil and chocolates, one could imagine a *piano* piled high with *buns*, a *shoe* used as a vase for *daffodils* and a *tree* with *chocolates* as fruit.
IV Spelling associations	Where there is confusion between the spelling of similar sounding words with different meanings, eg. stationery and stationary, the correct spelling can be helped by associating station*e*ry with *e*nvelopes.
V Roman Greek	This involves having a strong mental picture of a large house or palace, with a number of different rooms, passages and stairways which you can 'walk through' in your mind. You then associate each window or doorway with an idea or thing which you want to remember.

Conditions for good recall

ERRORS	– Try to avoid making mistakes.
RECENCY	– There is a tendency to remember the last thing you read.
FREQUENCY	– The more you test yourself the more you learn.
INTENSITY	– The more you concentrate the more you learn.
IMPORTANCE	– The more important the material is to you, the more you learn.
AFFECT (FEELINGS)	– Your state of mind, or how you feel, at the time of learning affects what you learn.
ASSOCIATION	– The more you can relate the material to be learned to other things the more you learn.

Learning to Understand something

Objective

To get students to realise that although books and teachers give them new knowledge, they still have to consider how to apply it. This involves some contribution of their own, such as ideas, observations or questions, as a result of which further information may or may not be required.

The students are, therefore, introduced to three aids to gaining understanding:—

- the making of comparisons
- problem-solving using guided discovery material
- the formulation of questions.

Note: Because this session deals with the most difficult concepts of MUD, it is as well for the tutor to work through Worksheet D before the session so that during it, feedback from the class is easier to handle.

Content and Purpose	Method and Materials
1. Revision of MUD grouping and identification of type of material that is involved in understanding. To introduce the idea that understanding involves making connections between ideas and developing new ones.	(i) Ask the class to recall the three groupings of methods of learning, ie. MUD, and refer to the 'U' as the subject matter of this session. (ii) Give out Worksheet D, page 43, and ask the class to complete question 1, ie. what they mean by the word 'understanding'. Lead discussion on the various interpretations given. **Note:** Definitions tend to fall into two broad categories: firstly passive ones including 'meaning, comprehension, knowledge'; and secondly, active ones including 'linking, manipulating, sorting, reasoning, questioning, comparing, connecting'. During the discussion, emphasise that full understanding involves the active elements. (iii) Give examples of the difference between 'knowing' and 'understanding', eg. safety precautions can be memorised, but it is necessary to know what they are for, when to use them and which to use. (Understanding.) Understanding requires something more than simple acknowledgement of a fact or idea; it is necessary to examine the new item by comparing it with existing ideas, observations or asking questions.
2. Students to experience a method of gaining understanding by generating their own questions and by comparing and contrasting different situations, without obtaining further information.	(i) Ask students to answer question 2 on Worksheet D, page 43, ie. what they understand by 'being interviewed'. Then ask them to deal with question 3, which is contrasting being interviewed with acting and going to a party. Ask the students to write down as many similarities and dissimilarities as possible under each of these topics. Last ask them to think of an activity of their own choice to compare and contrast with being interviewed. **Note:** A blank section on Worksheet D is provided for this.

Content and Purpose	Method and Materials
	(ii) Using the answers to question 2, write the ideas from all members of the class on the board. Then list the ideas which emerged from question 3, to show that by asking questions about similarities and differences, greater understanding develops about the nature of activity in question. Emphasise in the discussion, not only that more ideas arise from the activity of comparing and contrasting, but also the important point that this happens without any further information being given.
3. Experience of the guided discovery method using material appropriate to their course.	(i) Provide students with learning material suitable for their course. (See page 70 for examples.) Ask them to work in pairs to solve the problems posed by the material. When they have suggested solutions to as many of the problems as they can, ask them to formulate rules or principles which are central to the subject matter with which they are dealing. (ii) After 20 minutes note on the board the principles which students have suggested. Ask the class by discussion to arrive at an agreement about the best way of expressing these principles. (iii) When this has been done point out that these principles have been arrived at through problem-solving and discussion. (iv) The answers to the specific problems can then be reviewed. **Note:** The specific problems are dealt with last to emphasise that it is the process of developing concepts that we are examining rather than the particular problems. If no suitable problem-solving material is available, or if there is some free time in the session the following procedure can be used.
4. Alternative method of developing understanding.	(i) Ask the students to work in pairs and give them an essay subject which involves understanding of the topic, and which is related to their syllabus. (See page 101, for example.) Ask them to think of a number of questions about the topic, the answers to which would enable them to plan the essay. (ii) During feedback from the group, point out the role of 'why' questions in prompting explanation, whereas the 'who', 'where', 'what' and 'when' questions tend to be answered by facts.
5. Review of Session.	Give out and discuss hand-out 'Learning to Understand something', pages 44 and 45. Ask students to look back over the activities they have been engaged in during this and the preceding session. Ask them to say first what the differences were in methods of memorising from understanding. Secondly, what methods they used when developing understanding.

'How Do I Learn?'

Worksheet D

Name .... Date .... Course ....

1. Write down the meaning of 'understanding'

2. Write down what you understand by 'being interviewed'

3.

	How is being interviewed	
	Like	Different from
Acting?		
Going to a party?		

Learning to Understand something

Hand-out

Learning to *DO* something involves learning a procedure and then practising until we are skilful. Errors must be prevented if possible.

MEMORISING involves using various methods to enable us to recall the material in the same form as it was originally learned. Practice, in the form of repetition and testing, is helpful and, as with Learning to Do something, errors must be prevented as much as possible.

Learning to *UNDERSTAND* something is different from the above in a number of crucial respects. Repetition is *not* helpful, whereas errors can be. This is because the recognition of them allows us to remedy the inconsistencies and flaws in what we think we understand.

Another difference lies in the fact that memorising and doing, once accomplished, are always practised or repeated in the same way. By contrast, understanding is an active mental process involving thoughts which link or group ideas together in a new way in our minds.

How to help ourselves understand new ideas

We must find out about the subject in a way which makes sense to us. This means asking our own QUESTIONS which arise from our own ideas. We must work on the subject by making COMPARISONS and trying to SOLVE PROBLEMS.

Questions

QUESTIONING OURSELVES

To develop understanding, it is important that we do not just passively accept the explanation of others. Acquiring understanding, therefore, first involves asking ourselves questions and trying to answer them. If we are reading a book, or something is explained to us, or we watch a demonstration, we must ask ourselves at every stage: What does that mean? How does it relate to what we know already? What are its implications?

QUESTIONING OTHERS

If we cannot find the answers on our own, we must ask others such as colleagues, friends, and experts, until we are satisfied with the answers.

THE FORM OF QUESTIONING

'Why' questions usually identify the reasons for what goes on,

'Who, how, what, where and when', help mainly in describing, comparing and gaining information.

We must decide:

Whether or not our questions have been answered and if not, rephrase the questions;

What questions should follow to enlarge on or clarify parts of the answer;

What questions are needed to fill in gaps in our knowledge or understanding not so far covered.

Comparisons

After finding out by questioning as much as we can about the new facts or ideas, we must ask ourselves 'How is this information the same or different from ideas we have already?'. Questioning is being used here for the specific purpose of comparing what we know with what we have now gathered.

Equally, comparison can help to contrast what we know with its opposite, to which we may formerly have given little thought.

For example, if we are asked to describe a healthy animal, it would be helpful to consider what we have observed as the symptoms of an unhealthy animal:—

> High temperature, dull eyes, sores, a poor coat, no appetite and abnormal stools.

The opposite or absence of these helps us to define a healthy animal, and show that we understand what the term means.

Solving problems

Working out a problem expands our understanding by making us adapt and transfer the body of knowledge we have to a variety of different circumstances.

It is also good for identifying the extent of this knowledge and what more we need to know.

We should try to solve the problem by actively exploring a range of possible answers to our questions. The more we can extend this range of answers the more we will develop our understanding of the problem.

A major point is that by asking ourselves questions in order to try to solve problems, we are actively involving ourselves in reviewing and comparing our body of knowledge, and not passively waiting to be told.

Finally, a good way of checking our understanding of both the problem and its solution is to explain the process to others.

Revision of Learning methods

Objectives

1. To revise and consolidate learning methods appropriate to doing, memorising and understanding.

2. To draw attention to mentally passive and mentally active methods of learning and how passive methods can be turned into active methods.

3. To revise and consolidate the MUD concept and how it relates to materials in the students' syllabus.

Content and Purpose	Method and Materials
1. Outline of Final Session.	(i) Tell students they will be doing various kinds of learning in order to revise the methods that have been covered in the previous sessions. (ii) Explain to them that part of their course work will be used to demonstrate the need for memorising, doing and understanding methods.
2. Revision of Memorising.	Tell students they have five minutes to commit something to memory. **Note:** The task should be something chosen from their syllabus. Get them to check their own work. Discuss with them the methods of memorising they used. Discuss with them other methods they could have used. Identify *passive* methods, such as repeating and copying and how they can be transformed into *active* methods such as self-testing.
3. Revision of Understanding.	Give the students, who work in pairs, a series of course-related problems. (See page 70 for examples.) Ask them to solve the problems and to outline the principles underlying them as in Session 4, part 3. *Or* Give students an essay subject which involves understanding of the topic, and ask them to think of questions the answer to which would help them to plan their essays, as in Session 4, part 4. (See page 101, for examples.) After 10 minutes list all the students' suggestions and discuss.
To stress the importance of mentally active methods.	Emphasise that the concepts have been developed without further information by questioning and discussion, and that these are mentally *active* methods.

Content and Purpose	Method and Materials
4. Revision of Doing. How to identify areas needing clarification during a demonstration.	Tell students that they will be given an inadequate demonstration of a task. (See page 102, for example.) Ask them to identify areas not adequately covered and to formulate questions they would need to ask to enable them to do the task correctly themselves. **Note:** Pencils and scrap paper should be provided for them to jot down questions during the demonstration. When demonstration is finished lead group discussion around the questions the students had formulated. Emphasise the need for mental activity during a demonstration, when listening and watching. Briefly revise the Doing Session from the hand-out. Stress the 3 Ps: purpose, procedure and practice. Emphasise the need for minimising early mistakes in learning the procedure.
5. Course Review	Review the objectives of the course: (i) That the course was about METHODS of learning to help them in their future learning. (ii) That there are INDIVIDUAL differences in learning and the students should have found out about their own preferred methods, within each of the three categories of learning. (iii) That material to be learned has been grouped into activities, facts and concepts and the methods have been grouped in relation to the material. (iv) That mentally active methods are the most effective.
6. Relating the 'How Do I Learn?' course to their syllabus.	Review with students their syllabus and discuss with them the learning methods they think appropriate to its content.

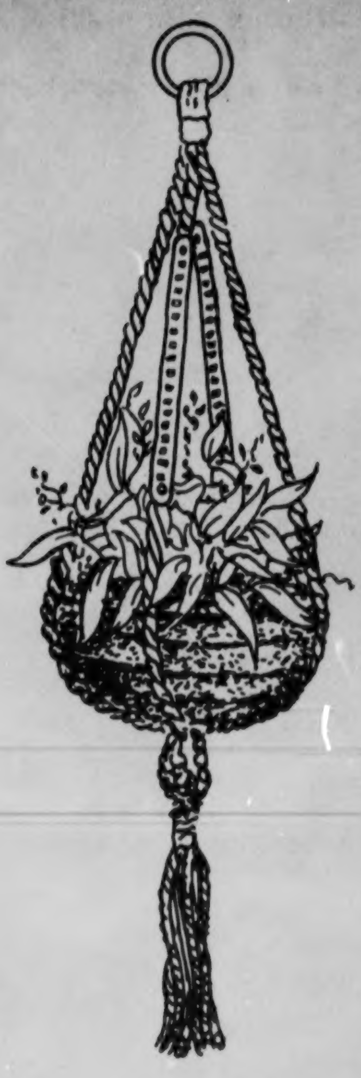
Examples of materials

Session 2

Examples of Materials to be Learned from Written Instructions—showing their use within the Experimental Groups

Material	Page	Groups				
		C & G 730 Teachers	Combined 'A' level/ Hospital Services	New Opportunities	Into Work	Gas Service Engineers
Macramé	49	X	X	X		
Paper Folding (Water Lily)	50	X	X	X		
Wiring a Plug	51				X	
Wire Rack Assembly	53				X	
Thermo-Electric Device	54					X
Relay Valve	56					X

LEARNING TO LEARN – DOING

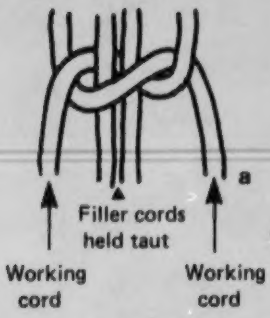


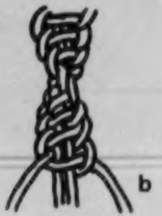
Macramé

Half Knot

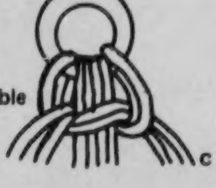
1. Hold filler cords tight (attach end to desk, etc.)
2. Lay left hand cord over filler cords
3. Place right hand cord over left hand cord, take behind filler cords and through
4. Repeat operation exactly . . .

Half Knot


a
Filler cords held taut
Working cord
Working cord



A sinnet of half knots

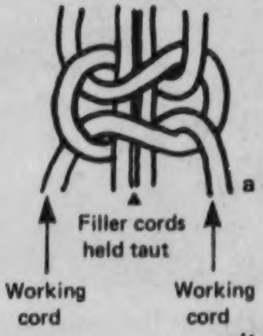


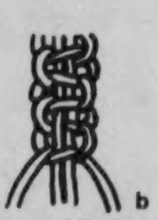
Half knot using double knotting threads

Flat Knot

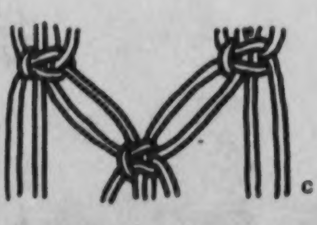
1. Repeat as for half knot but lay **opposite** cord over filler cord each time.

Flat Knot


a
Filler cords held taut
Working cord
Working cord



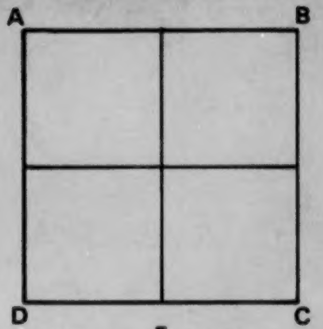
A sinnet of flat knots



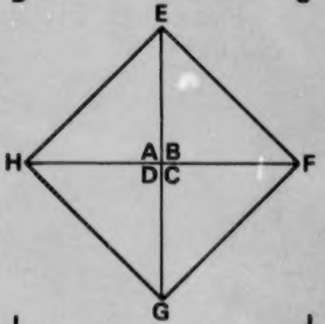
How to divide sinnets, and work an alternative flat knot

Instructions for making a Serviette Water-lily

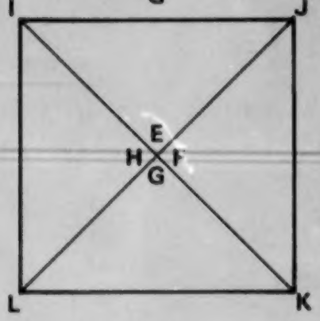
1 Fold paper serviette in half and half again.



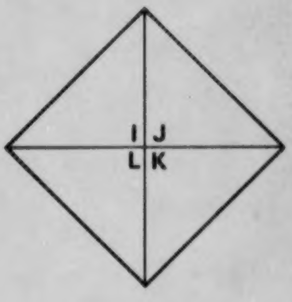
2 Take each corner in turn and fold to the middle.



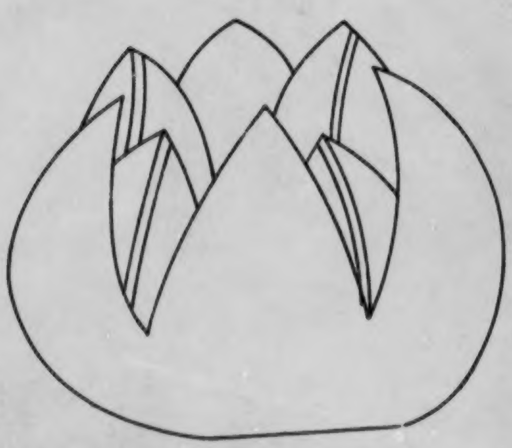
3 Take each new corner in turn and fold to the middle again.



4 Turn the new square over and again fold each corner in turn to the middle.



5 Hold the centre of the square between finger and thumb to keep the corners in place. Bring each single flap in turn from the back over the top to form a leaf. Bring over the four remaining flaps in turn to form outer leaves.

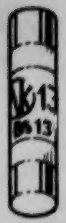


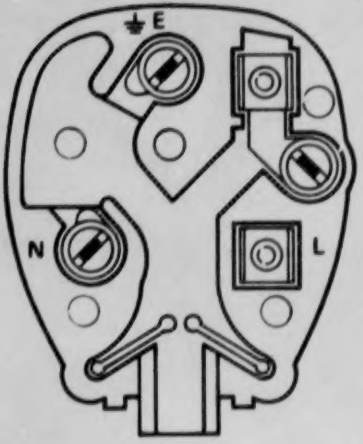
Wiring a plug

Opening the plug

Unscrew the big screw in the centre of the plug.
Take the top off and then take out the fuse.

The fuse looks like this

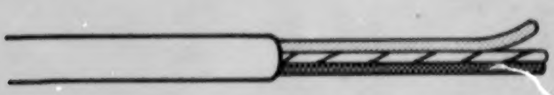


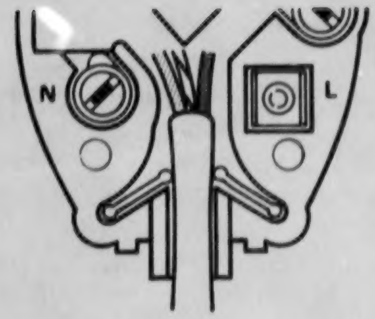


The plug will now look like this

Trimming the flex

The flex looks like this



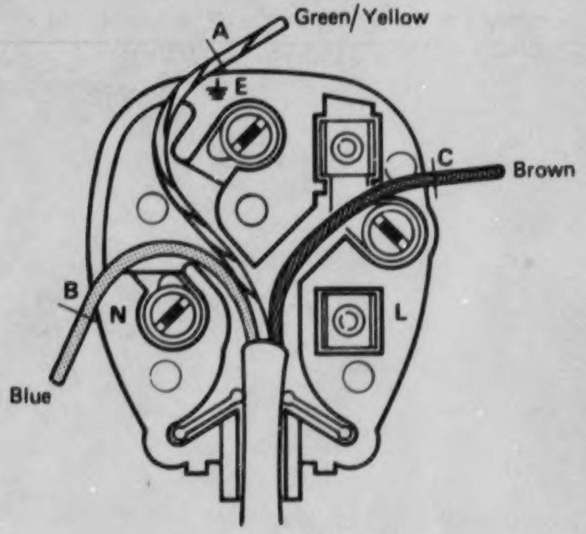


Notice the flex has 3 different coloured wires
running through the middle:—
1 brown, 1 blue, 1 yellow/green

You will need to trim the wires so that they are the right length to go inside the plug. A good idea is to put the flex into the plug. Check that the flex will be held by the cord grip.

This is a picture of the cord grip

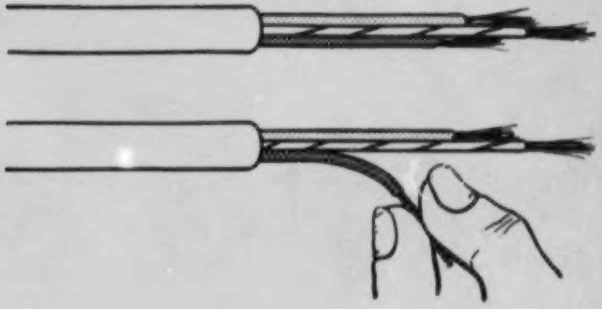
Cut in these 3 places



Measure by looking how long the blue, brown and green/yellow wires will need to be to reach their pins.

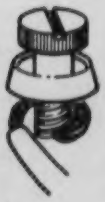
Now cut each covered wire **right through** at the points marked by the arrows.

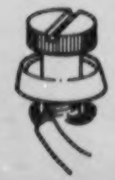
Now trim off the inner rubber or plastic casing to a length of about 1 cm. or a little more using a knife or wire stripper. TAKE CARE NOT TO CUT INTO THE LITTLE WIRES INSIDE. Gently twist the strands of each wire so that they are not spread out.



Fixing the flex in the plug

First, run the flex between the squeeze grip. Then, find the 3 little brass screws. Undo the brass screws to allow the wire to pass underneath. Now, wind the wire CLOCKWISE ↷ round the pins and do up the washered round nuts. You will sometimes find it easier to take these off first.





Assembly Instructions
Model 483
Sideliner 5 Tier

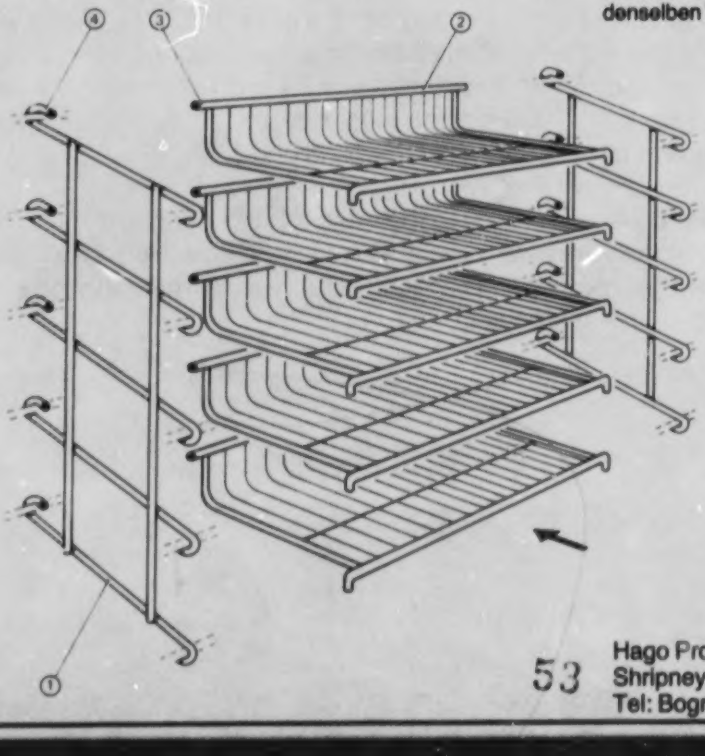
A. Place side panel (1) on a flat surface.
B. Take a shelf (2) and locate the rear tail (3) in the 'S' wire (4) on side panel.
C. To locate the front apply pressure to the shelf in the direction of the arrow and spring the tail into position.
D. Continue this procedure, assembling the trays onto the same side panel.
E. Assemble the other side panel using the same procedure.

Instructions d'Assemblage
Modèle 483
L'étagère – Sideliner – 5 Rangs

A. Placer le panneau de côté (1) sur une surface plate.
B. Prendre un étage (2) et placer le bout arrière (3) dans le 'S' fil (4) sur le panneau de côté.
C. Pour établir le devant pousser l'étage dans la direction de la flèche et mettre le bout en avant en position.
D. Répéter ce procédé en montant les étages sur le même panneau de côté.
E. Assembler l'autre panneau de côté de la même manière.

Montagevorschriften
Modell 483
Brettergestell – Sideliner – 5 Reihen

A. Stellen die Seitenwand (1) auf eine ebene Fläche.
B. Nehmen ein Brett (2) und legen den hinteren Punkt (3) in den 'S' Draht (4) der Seitenwand ein.
C. Um den Vorderteil des Brettes zu befestigen drücken in der Pfeilrichtung darauf und spannen den vorderen Punkt in die Seitenwand ein.
D. Wiederholen diesen Vorgang und legen weitore Bretter auf dieselbe Seitenwand.
E. Setzen die Bretter auf die andere Seitenwand nach denselben Vorgang zusammen.



Hago Products Limited
Shripney Road, Bognor Regis, Sussex
Tel: Bognor Regis 3131

Assembly instructions for the thermo-electric device

Tools required:

1. No. 2 Phillips screwdriver.
2. Smooth jawed adjustable spanner.
3. Small screwdriver.
4. Pair of pliers.

The attached diagram illustrates the separate components.

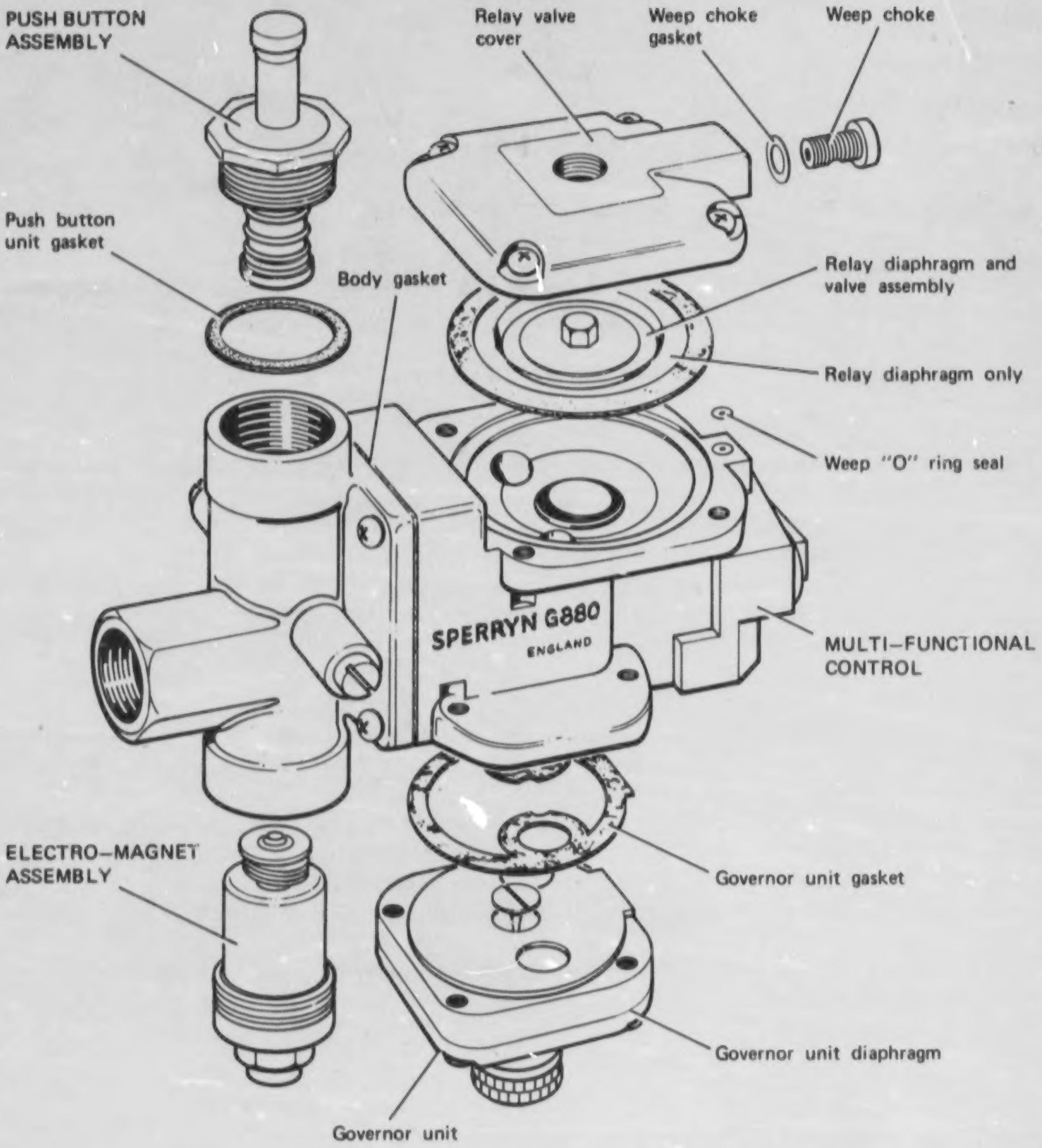
Note: The thermo-electric device is only one complete part of a multi-functional control system.

1. Commence assembly with the electro-magnet housing – check that you have the correct parts (see diagram right hand corner). Stand housing on bench top with centre spindle pointing upwards. Place the return spring over the spindle to seat against the shoulder of the housing. Next place the valve bearing dish, neoprene valve and brass washer on top of the spring, ensure that the centre hole of these parts lines up with the centre spindle.

2. With the jaws of the pliers (opened an appropriate gap) placed on top of the brass washer, push downwards so that the upward push of the spring is overcome and the spindle projects through the centre hole of the brass washer. Fit the circlip in its position round the groove in the spindle, release pliers and check that parts are securely held. Lay assembly on one side until later.

3. Now check that you have the correct parts for the push-button assembly (see diagram left-hand corner). First insert brass washer to the bottom of circular recess in the housing. Fit return spring onto the push button spindle and pass button into the circular recess, make sure that the button is free to push home. Stand the housing on bench top and mount, spring, valve dish, valve and brass washer as in (1). Using the same technique as in (2) compress the spring so that the spindle projects through the centre holes of the parts and secure by clipping the circlip in its circular recess. Check that components are secure. Place on one side.

4. Attach the main body of the thermo-electric device to the multi-functional control using the four securing screws. Make sure that the cork sealing washer is in good condition. Next, screw the push-button and magnetic assemblies into their respective places in the housing (do not overtighten). Check that the push-button travels freely.


PUSH BUTTON ASSEMBLY
Relay valve cover
Weep choke gasket
Weep choke
Push button unit gasket
Body gasket
Relay diaphragm and valve assembly
Relay diaphragm only
Weep "O" ring seal
SPERRYN G880
ENGLAND
MULTI–FUNCTIONAL CONTROL
ELECTRO–MAGNET ASSEMBLY
Governor unit gasket
Governor unit diaphragm
Governor unit

Assembly instructions for the relay valve

Tools required:

1. No. 2 Phillips screwdriver.
2. Smooth jawed adjustable spanner.
3. Small screwdriver.

The attached diagram illustrates the separate components.

1. Lay out all the separate parts in accordance with the diagram. Check to ensure that you have a complete set of parts.

2. Commence assembly by grouping the parts of the valve and diaphragm section. Proceed as follows.

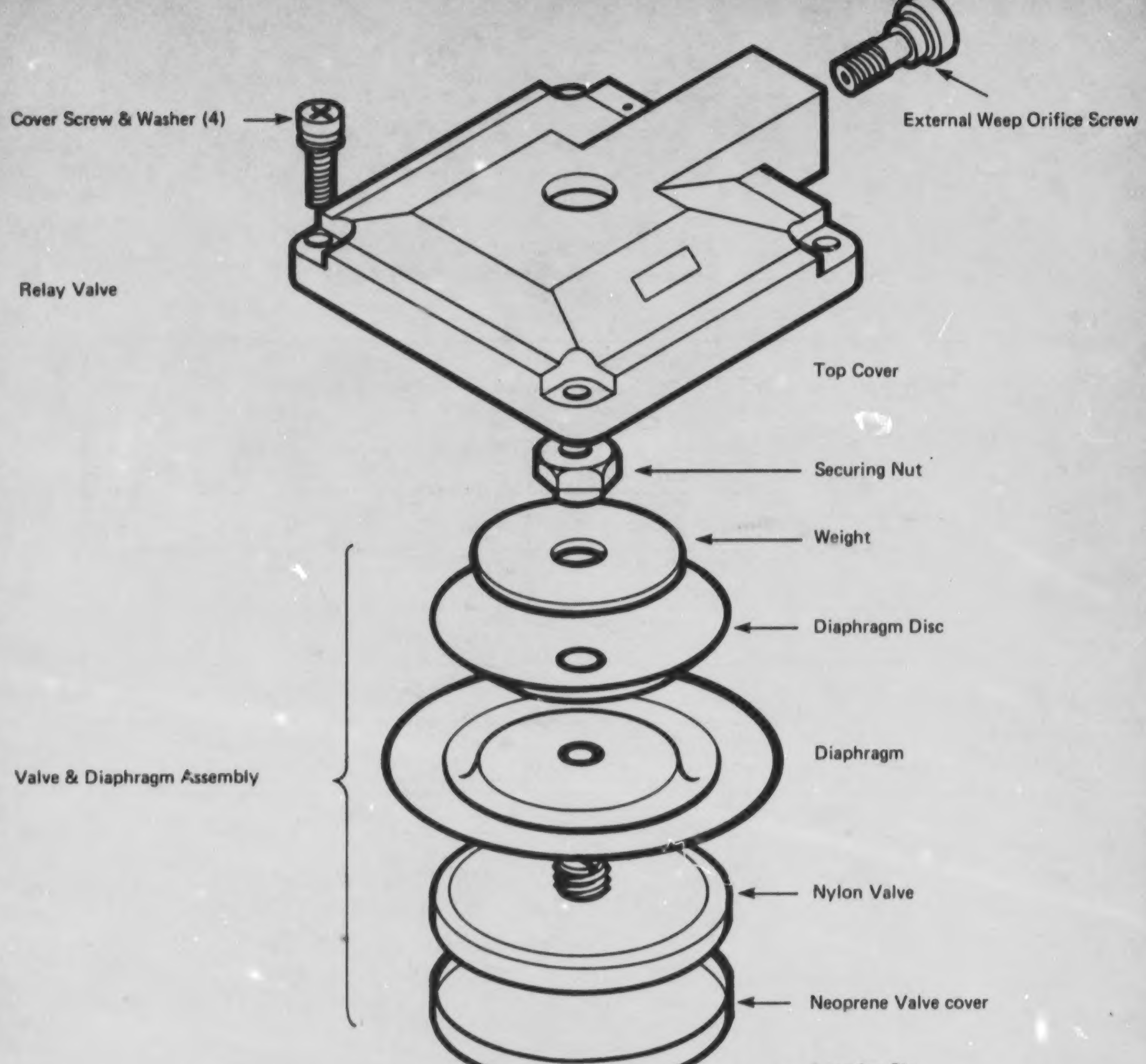
3. Squeeze the neoprene cover over the face of the nylon valve, making sure that it fits snugly to the rim.

4. Pass the valve stud through the centre hole of the diaphragm (see diagram for correct way round). Now place the diaphragm disc, weight and securing nut over the threaded stud and gently screw home the nut until the whole assembly is firmly fixed together.

5. Take up the valve section (body) and first screw home the by-pass screw – do not overtighten. Set the valve assembly into the valve section – make sure that the periphery of the diaphragm sits evenly in the circular groove on the body. (This will ensure a gas tight seal when the top cover is fitted.)

6. Next the top cover may be fitted to the valve body – the correct position for the top cover is found by mating the hole in the top cover with the projecting location pin at the top edge of the body. Insert the four securing screws and tighten alternate screws to make sure that the top cover is drawn to the body section evenly to effect a gas tight seal. Do not screw down too tightly.

7. Finally screw the external weep orifice into the threaded hole in the side of the top cover. Check that all parts have been included.


Cover Screw & Washer (4)
External Weep Orifice Screw
Relay Valve
Top Cover
Securing Nut
Weight
Diaphragm Disc
Diaphragm
Valve & Diaphragm Assembly
Nylon Valve
Neoprene Valve cover
Location Pin
Weep Orifice
Valve Body
By-pass screw

Examples of Tasks to be Learned by Undoing – showing their use within the Experimental Groups

	Groups				
Material	C & G 730 Teachers	Combined 'A' level/ Hospital Services	New Opportunities	Into Work	Gas Service Engineers
Chinese Puzzle	X	X	X		
Mortice Lock				X	
Part of Car Engine					
Part of Machine					
Low Pressure Cut-off Valve					X

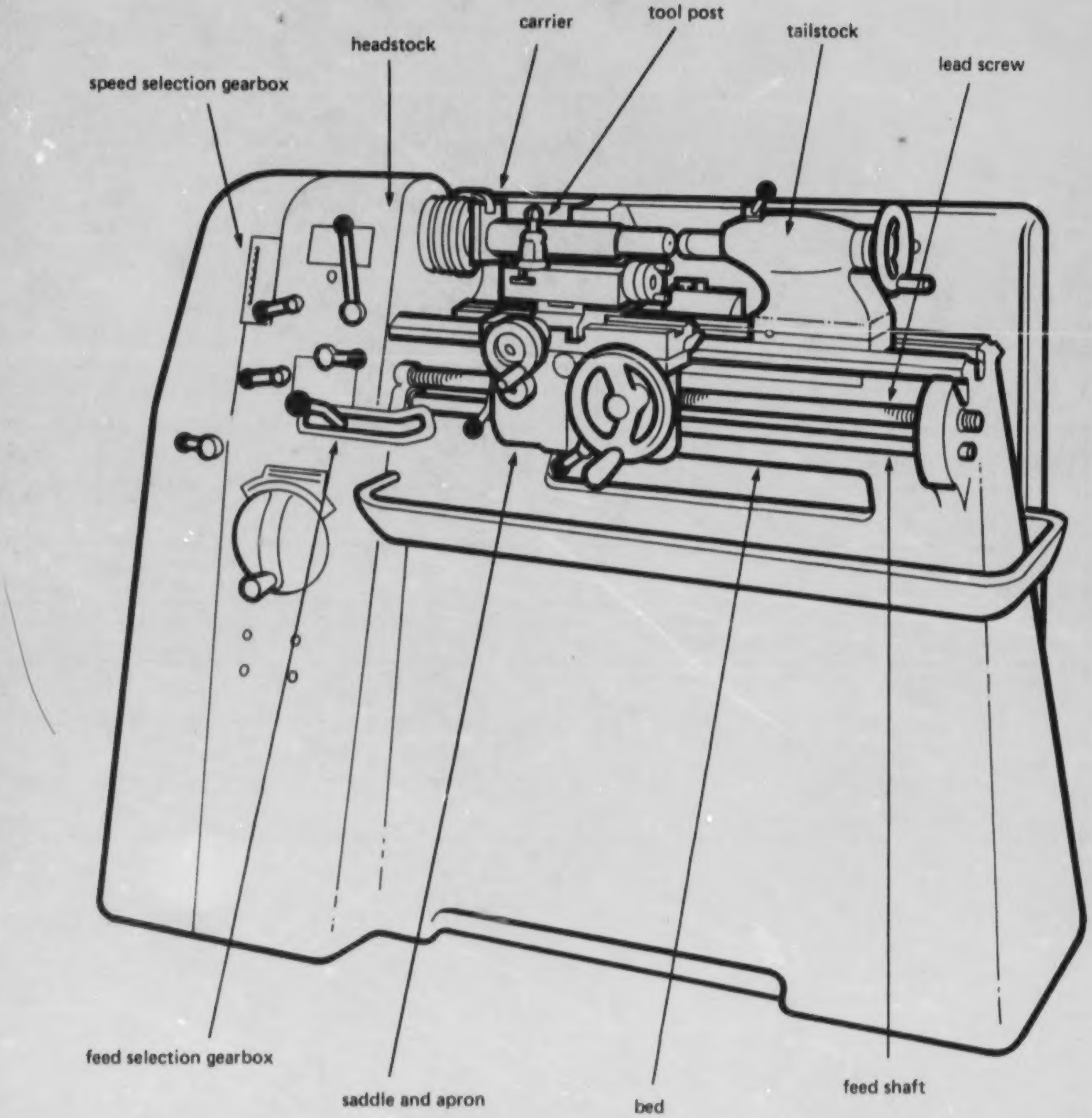
No material included in manual.

Examples of Tasks to be Memorised – showing their use within the Experimental Groups

Material	Groups				
	C & G 730 Teachers	Combined 'A' level/ Hospital Services	New Opportunities	Into Work	Gas Service Engineers
Parts of a Lathe					
Parts of the Brain		X			
Parts of a Meter					X
List of References		X			
Inland Telephone Call Charges			X		
Checks to Carry Out When Diagnosing Cooker Complaints					X
Summary of Teaching Principles	X				
Poems*	X	X	X		
Colour Coding of London Underground Lines*				X	
Screw Thread Sizes*					

*Material not included.

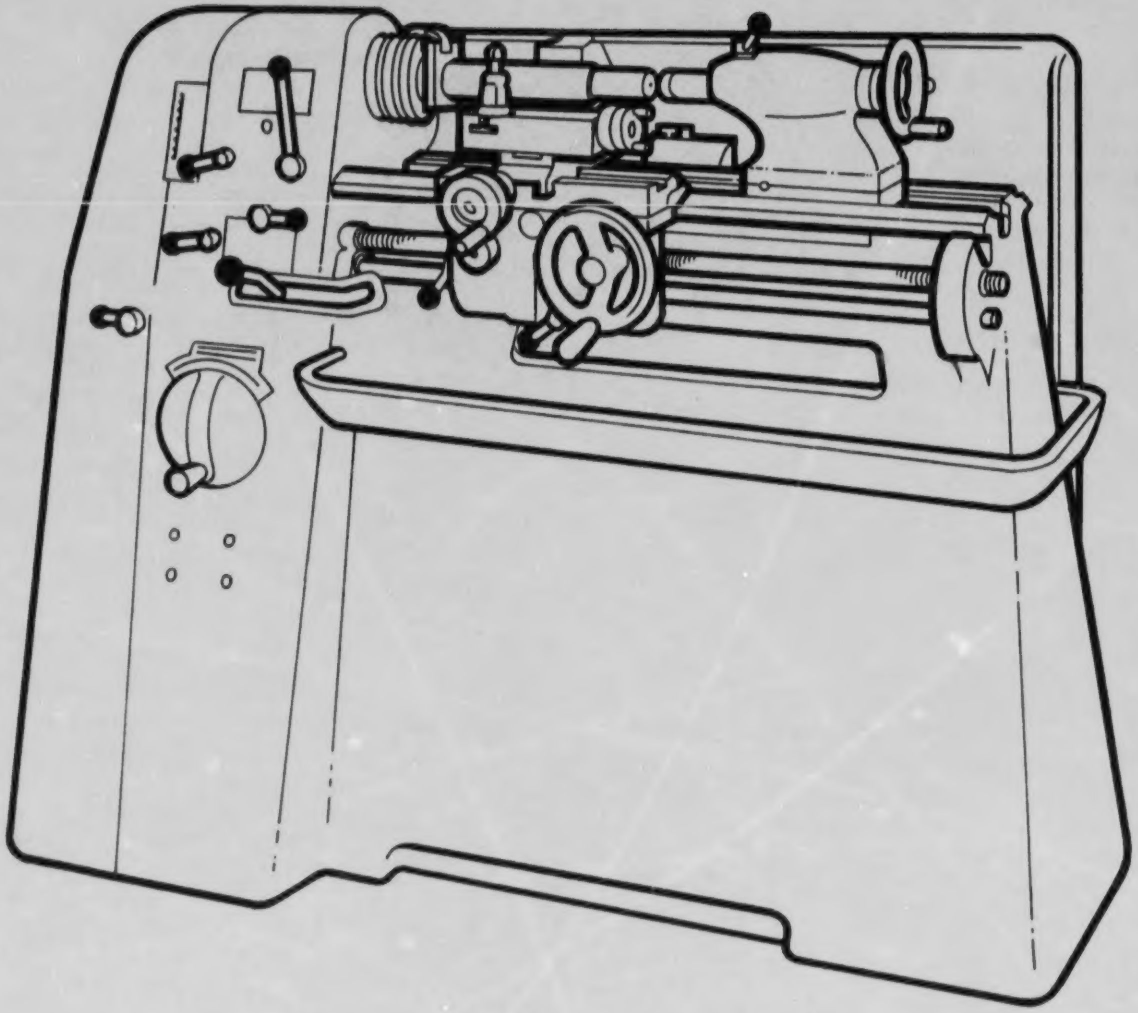
Lathes are used for machining processes where the work can be conveniently turned and cut with a tool.


carrier
tool post
headstock
tailstock
lead screw
speed selection gearbox
feed selection gearbox
saddle and apron
bed
feed shaft

The Centre Lathe

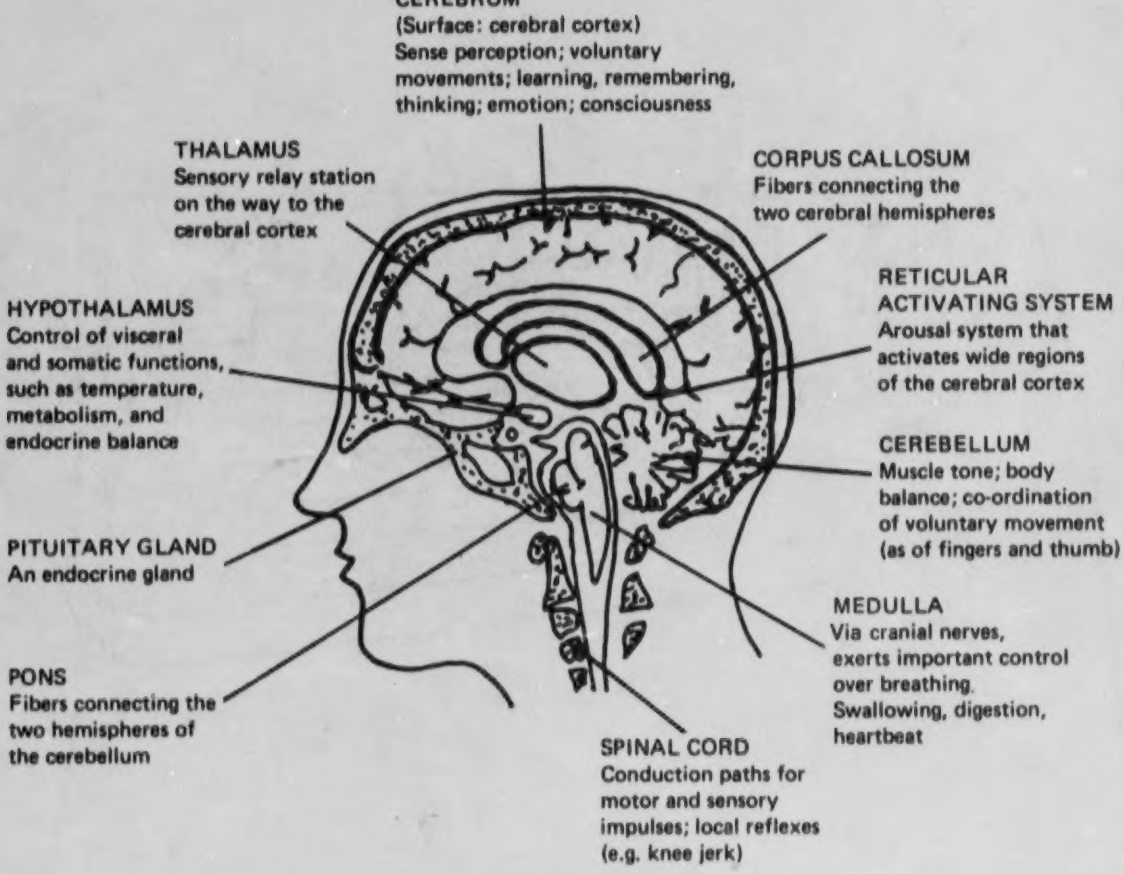
Lathes

Lathes are used for machining processes where the work can be conveniently turned and cut with a tool.



The Centre Lathe

Parts of the brain


CEREBRUM
(Surface: cerebral cortex)
Sense perception; voluntary movements; learning, remembering, thinking; emotion; consciousness
THALAMUS
Sensory relay station on the way to the cerebral cortex
CORPUS CALLOSUM
Fibers connecting the two cerebral hemispheres
RETICULAR ACTIVATING SYSTEM
Arousal system that activates wide regions of the cerebral cortex
HYPOTHALAMUS
Control of visceral and somatic functions, such as temperature, metabolism, and endocrine balance
CEREBELLUM
Muscle tone; body balance; co-ordination of voluntary movement (as of fingers and thumb)
PITUITARY GLAND
An endocrine gland
MEDULLA
Via cranial nerves, exerts important control over breathing. Swallowing, digestion, heartbeat
PONS
Fibers connecting the two hemispheres of the cerebellum
SPINAL CORD
Conduction paths for motor and sensory impulses; local reflexes (e.g. knee jerk)

Parts of the brain

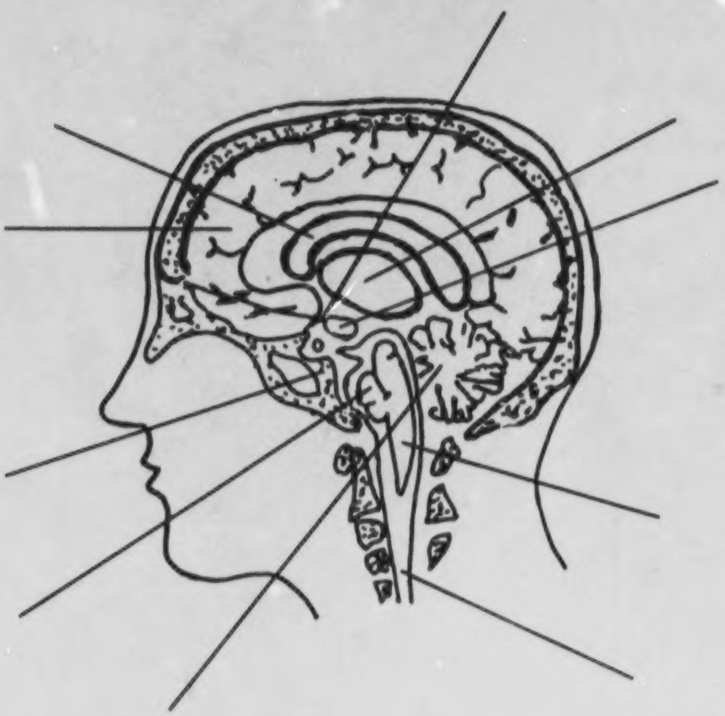


Diagram of a meter

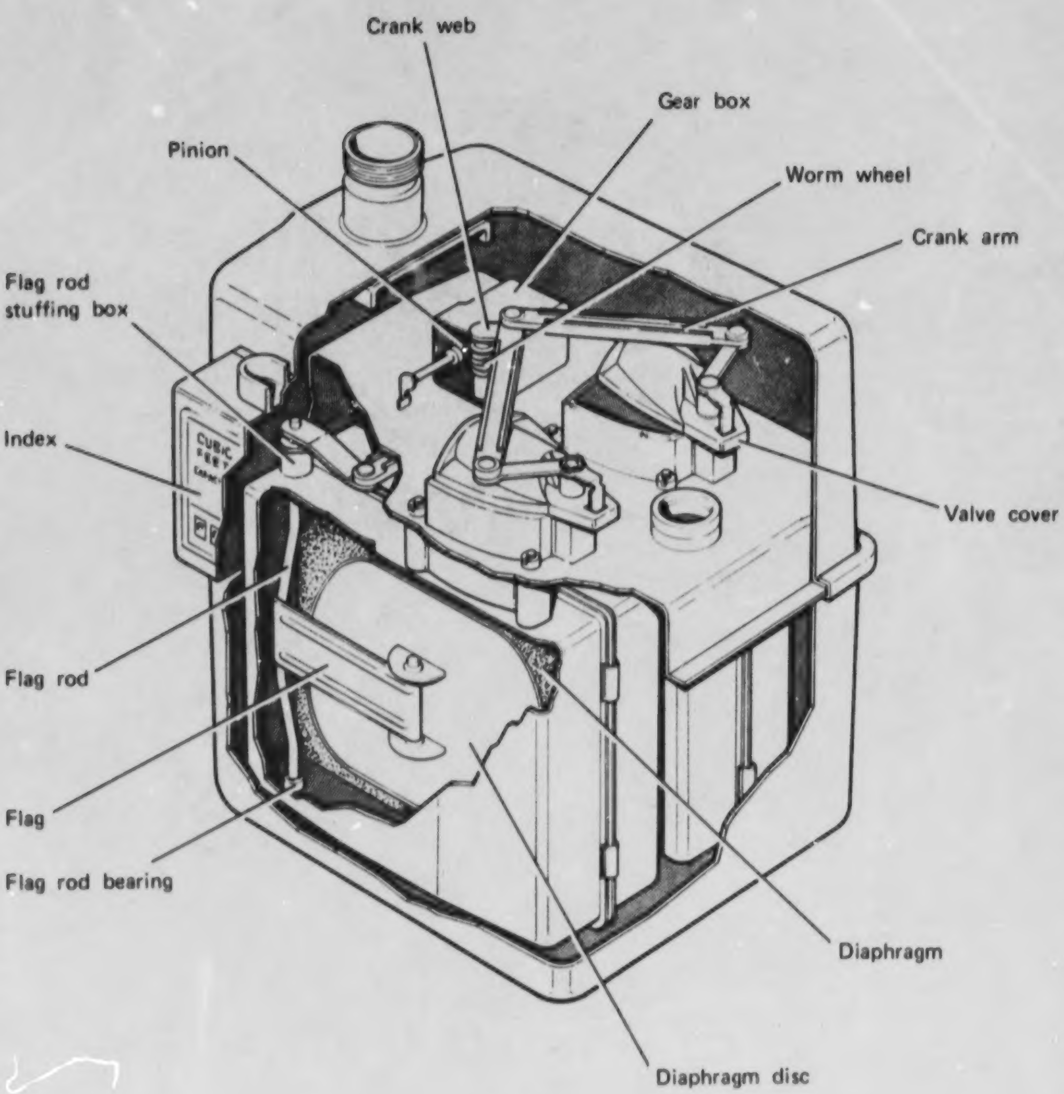
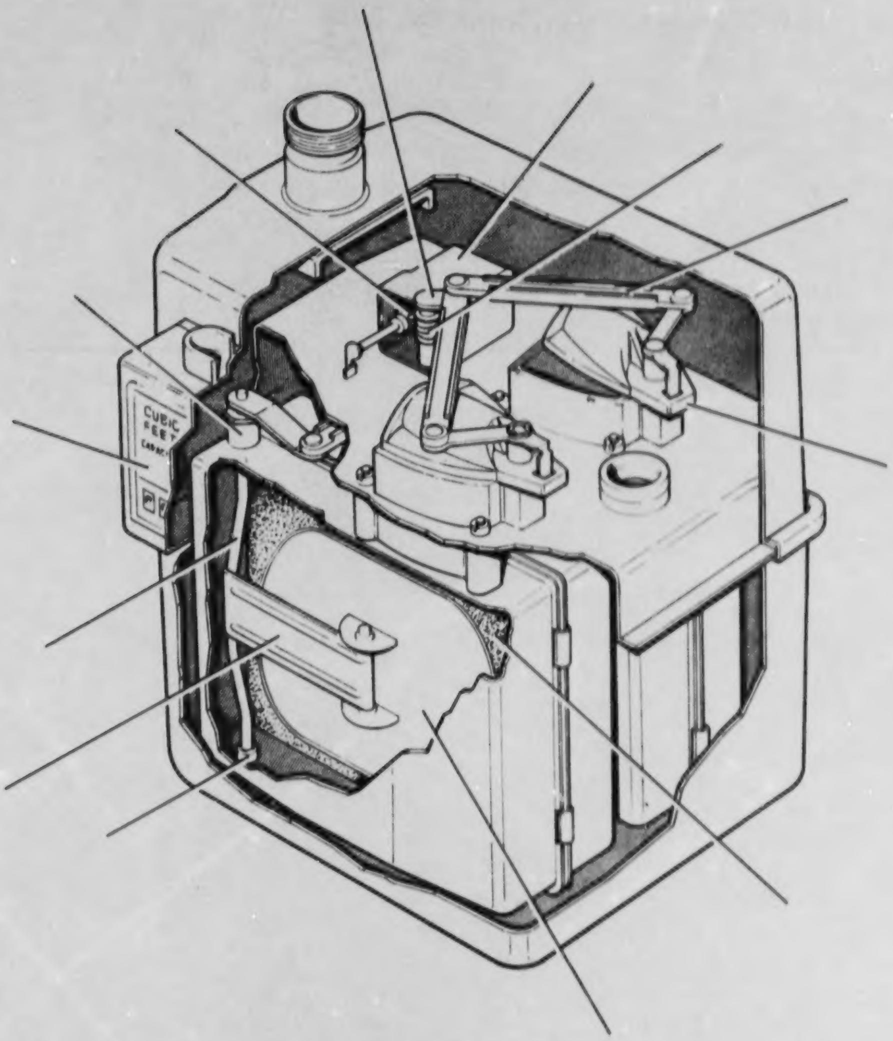

Crank web
Gear box
Pinion
Worm wheel
Crank arm
Flag rod stuffing box
Index
CUBIC FEET
Valve cover
Flag rod
Flag
Flag rod bearing
Diaphragm
Diaphragm disc

Diagram of a meter



Deprivation and the effects of early experience

Animal studies
Harlow – Surrogate mothers
Riesen – Perceptual deprivation
Rosenblum – Separation of infant and mother

Human studies
White – Enriched environment and stimulation of infants
Bowlby – Mother child separation
Goldfarb – Foster homes and institutionalised infants

(at October 1979)

	Dialled direct Time allowed for 3p in any one call
From exchange with STD facilities	
Peak rate (Mon–Fri 9 am–1 pm)	
Local	2 mins
up to 56 km	30 secs
over 56 km	10 secs
Standard rate (Mon–Fri 8 am–9 am and 1 pm–6 pm)	
Local	3 mins
up to 56 km	45 secs
over 56 km	15 secs
Cheap rate (all other times)	
Local	12 mins
up to 56 km	3 mins
over 56 km	1 min

1 Flame picture satisfactory; aeration and pressure correct.

2 Flame failure device is fully open and operative.

3 Thermostat operates; valve closes correctly and by-pass is clear.

4 Oven flue is clear and thermostat rod or phial is correctly positioned.

5 Oven door seals properly.

6 Oven furniture is correctly assembled; shelves right way round and level.

Summary of teaching principles

1 Define course objectives in terms of what the student should know and be able to do at the end of the course.

2 Make the subject matter relevant to the aims and objectives of a course or unit of instruction.

3 Organise teaching material in progressive steps, determined by the students' knowledge and their individual needs.

4 Grade subject matter so as to organise success and minimise failure.

5 Allow the student to proceed at his optimum rate.

6 Involve the student actively in his learning.

7 Give the student continual knowledge of his progress throughout a course.

8 Ensure that the student masters each unit of teaching material before continuing with the next unit.

9 Organise periodic testing and revision of course work.

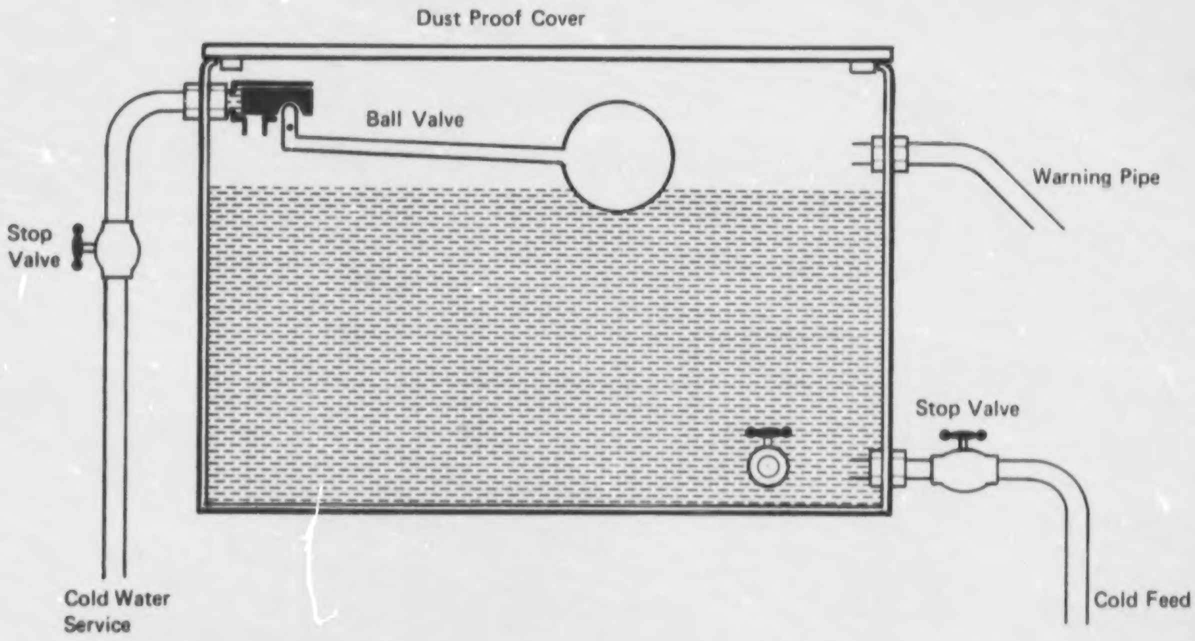
Examples of Materials for Problem-Solving — showing their use within the Experimental Groups

Material	Groups				
	C & G 730 Teachers	Combined 'A' level/ Hospital Services	New Opportunities	Into Work	Gas Service Engineers
Cold Water Storage System					X
Gravity Hot Water Circulation					X
Design of Experiments		X			
Behaviour at Work (Factory)				X	
Behaviour at Work (Hotel)			X	X	

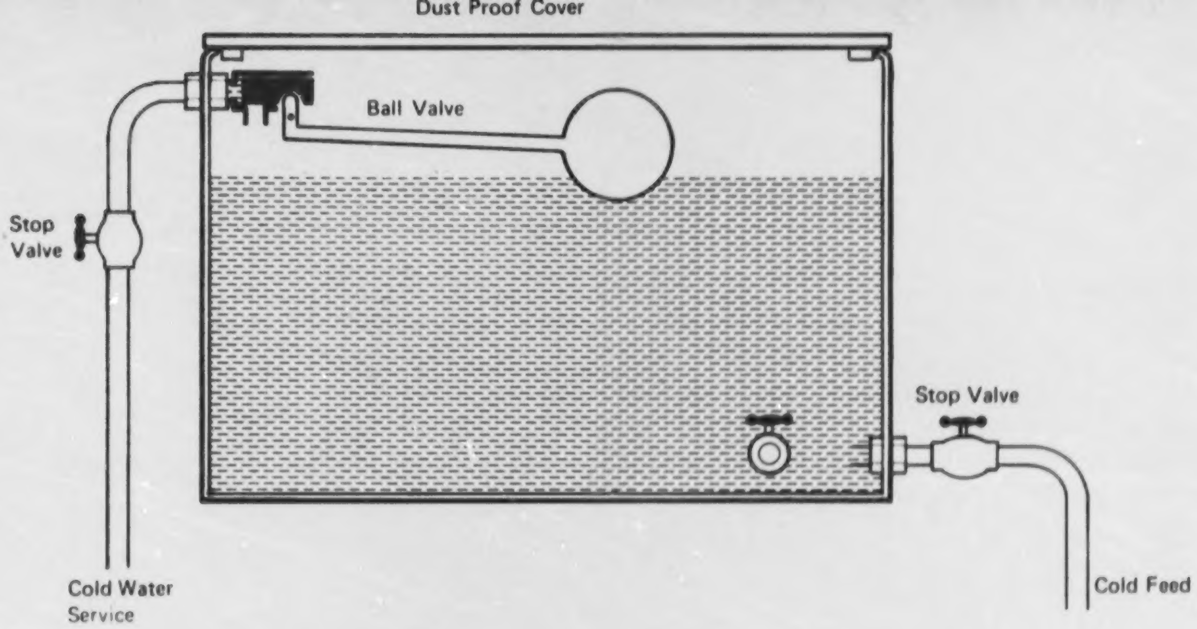
Cold Water Storage System

Automatic ball-valve

When water is drawn off from the cistern the water level will drop; this in turn lowers the ball and opens the valve. Water then flows through the ball-valve to refiil the cistern. When water is no longer being drawn from the cistern the incoming water will eventually raise the ball to its original position and the normal water level will be restored. At this stage the ball-valve will once again be closed and the water shut off.


Dust Proof Cover
Ball Valve
Warning Pipe
Stop Valve
Stop Valve
Cold Water Service
Cold Feed

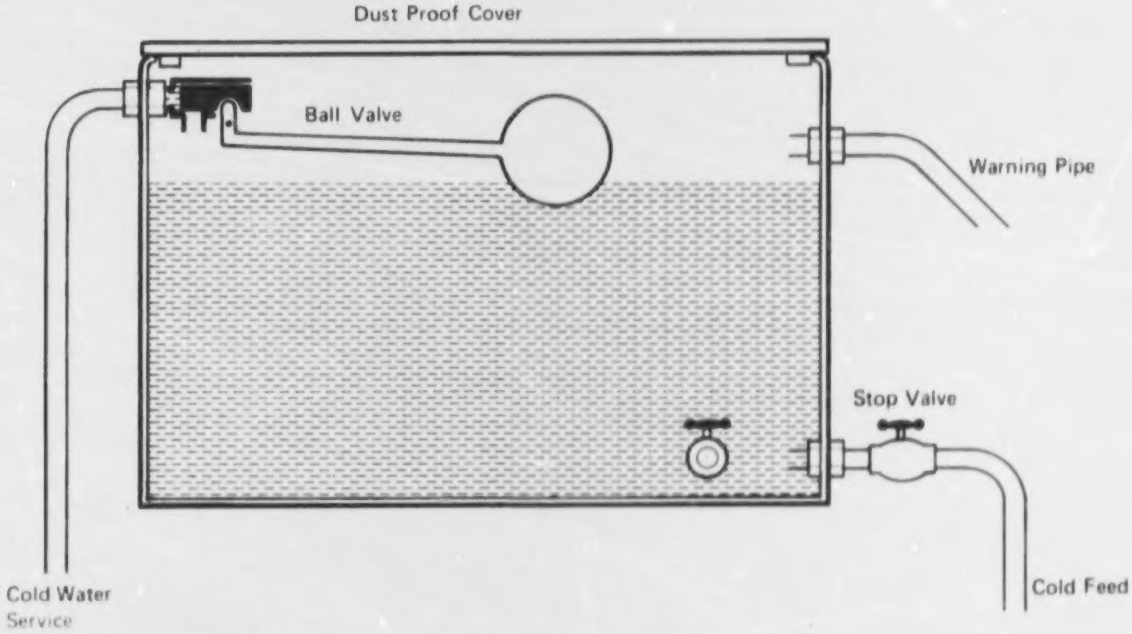
This diagram is correct.


Dust Proof Cover
Ball Valve
Stop Valve
Stop Valve
Cold Water Service
Cold Feed

Problem 1

1 What is wrong?

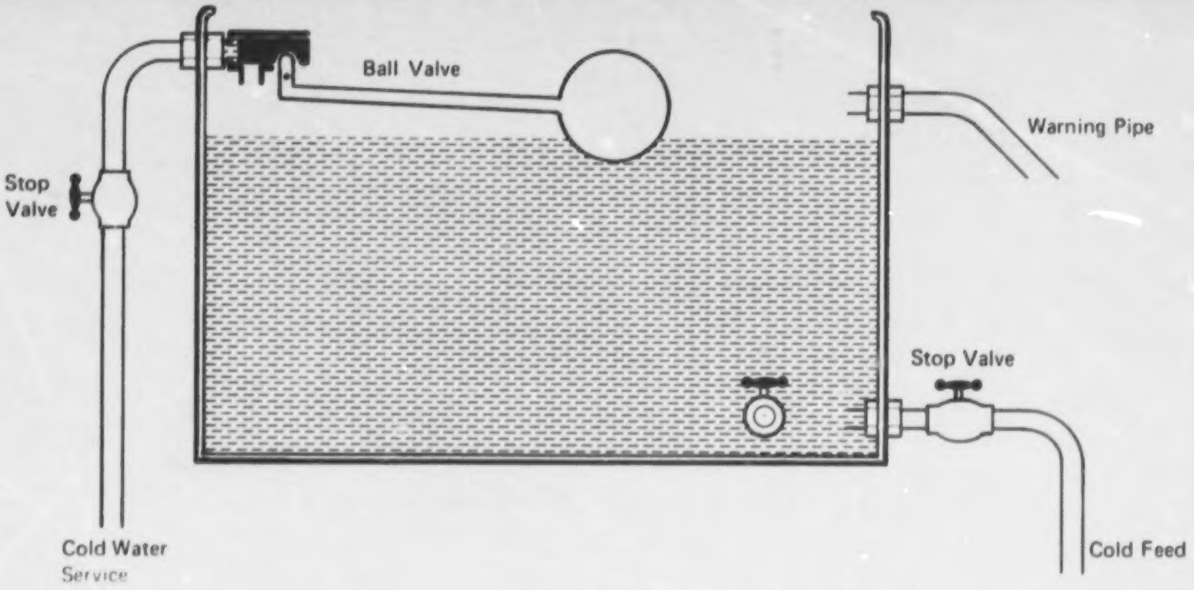
2 What would the effect be?


Dust Proof Cover
Ball Valve
Warning Pipe
Stop Valve
Cold Water Service
Cold Feed

Problem 2

1 What is wrong?

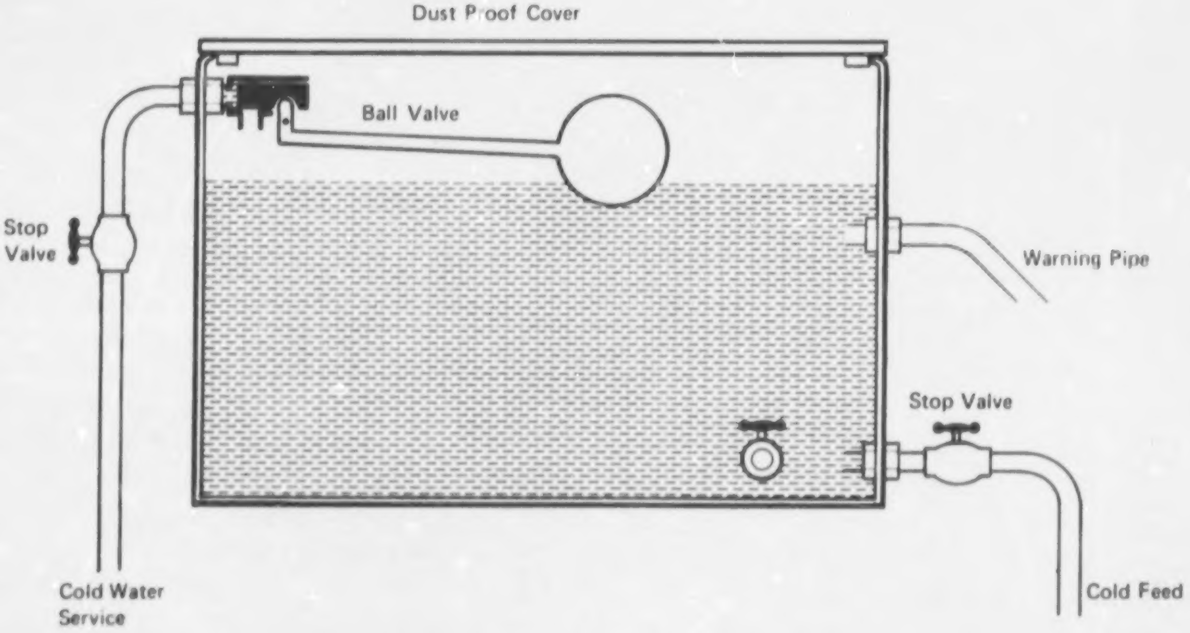
2 What would the effect be?


Ball Valve
Warning Pipe
Stop Valve
Stop Valve
Cold Water Service
Cold Feed

Problem 3

1 What is wrong?

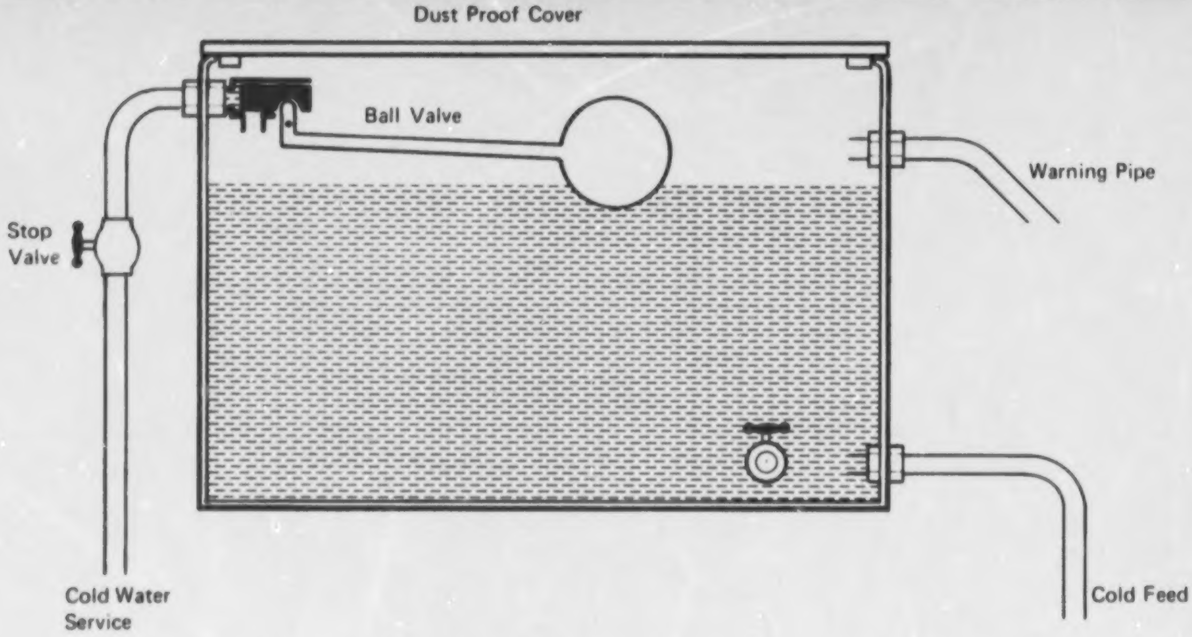
2 What would the effect be?


Dust Proof Cover
Ball Valve
Stop Valve
Warning Pipe
Stop Valve
Cold Water Service
Cold Feed

Problem 4

1 What is wrong?

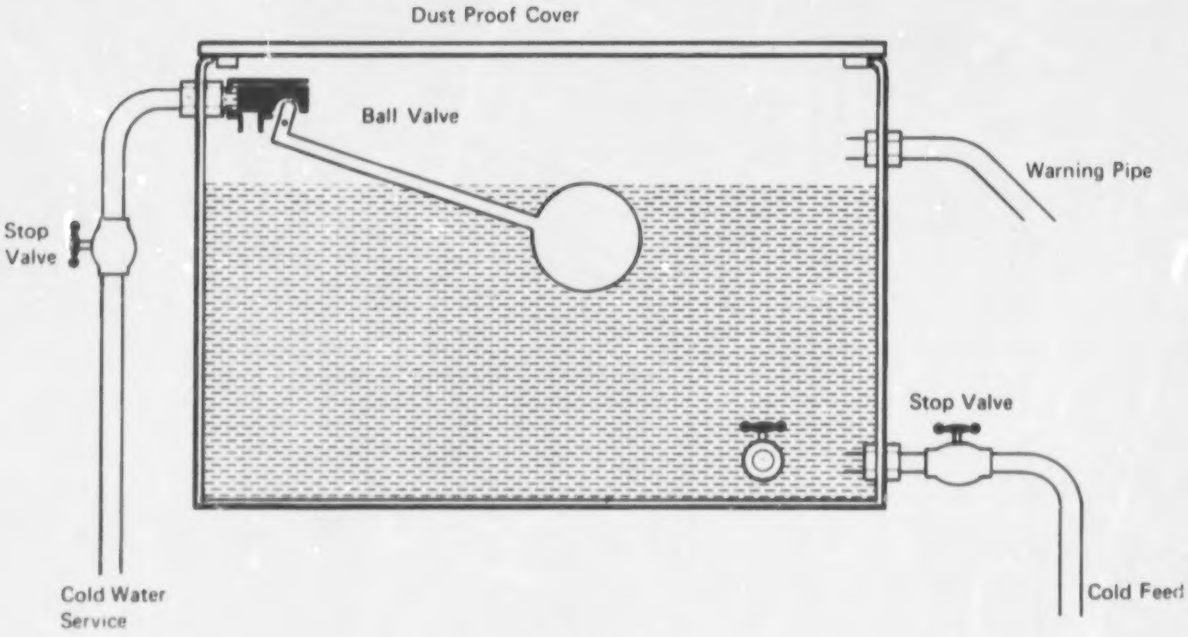
2 What would the effect be?


Dust Proof Cover
Ball Valve
Warning Pipe
Stop Valve
Cold Water Service
Cold Feed

Problem 5

1 What is wrong?

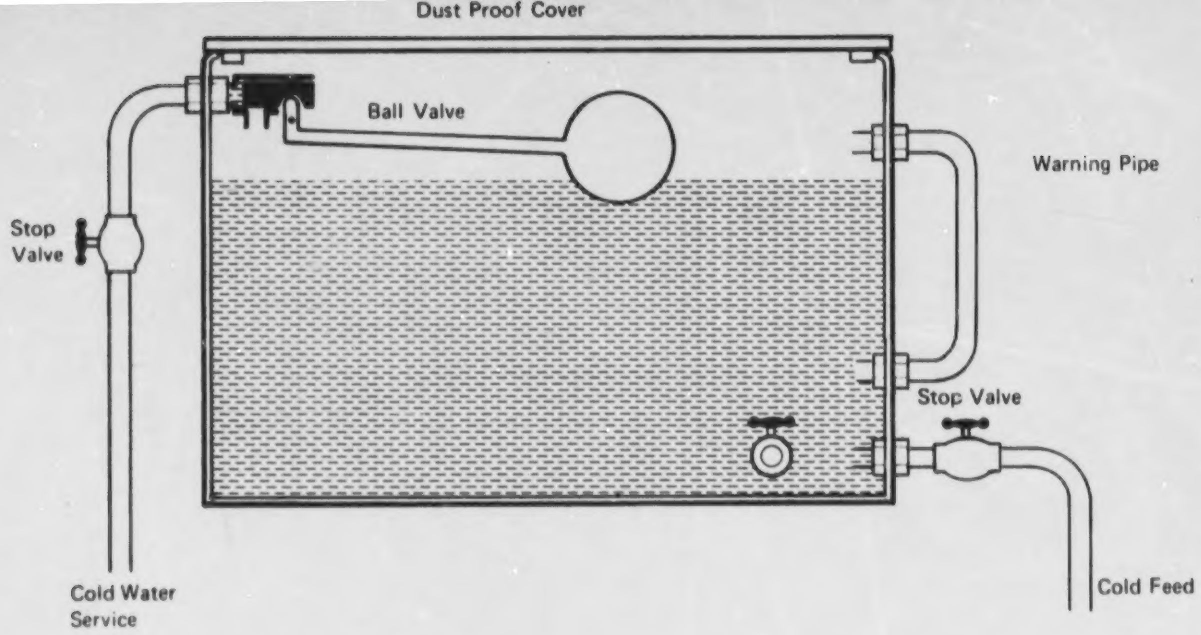
2 What would the effect be?


Dust Proof Cover
Ball Valve
Warning Pipe
Stop Valve
Stop Valve
Cold Water Service
Cold Feed

Problem 6

1 What is wrong?

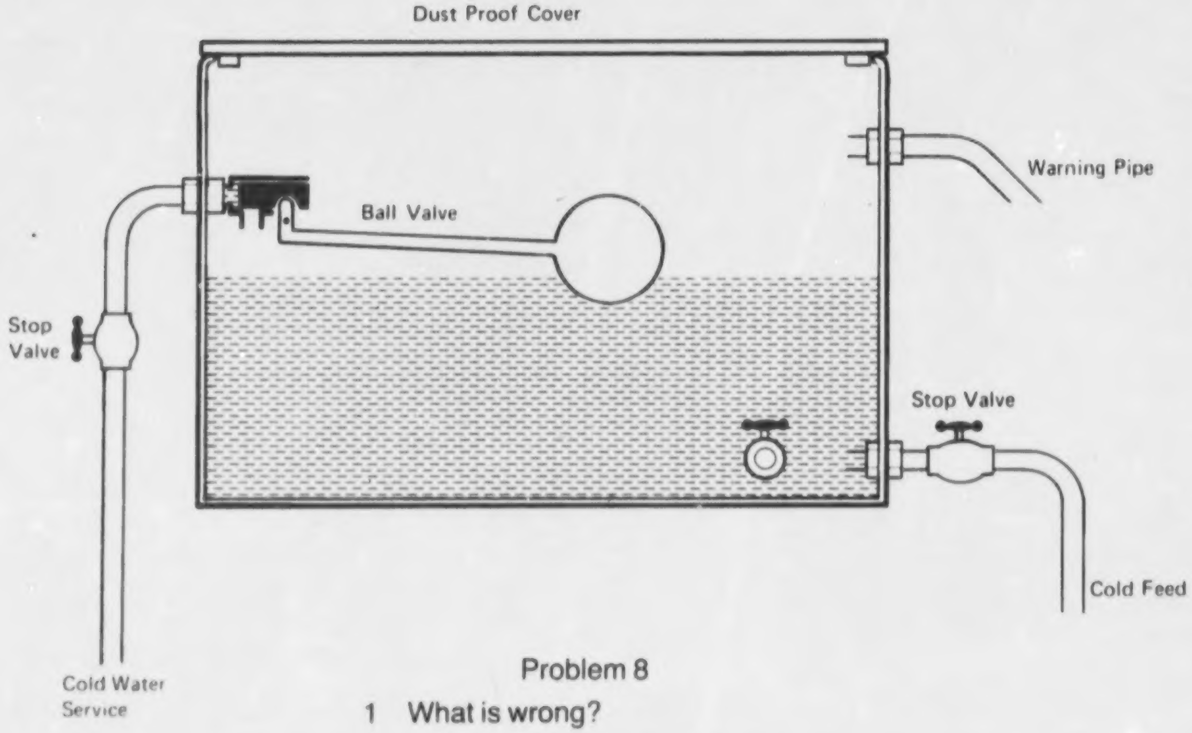
2 What would the effect be?


Dust Proof Cover
Ball Valve
Warning Pipe
Stop Valve
Stop Valve
Cold Water Service
Cold Feed

Problem 7

1 What is wrong?

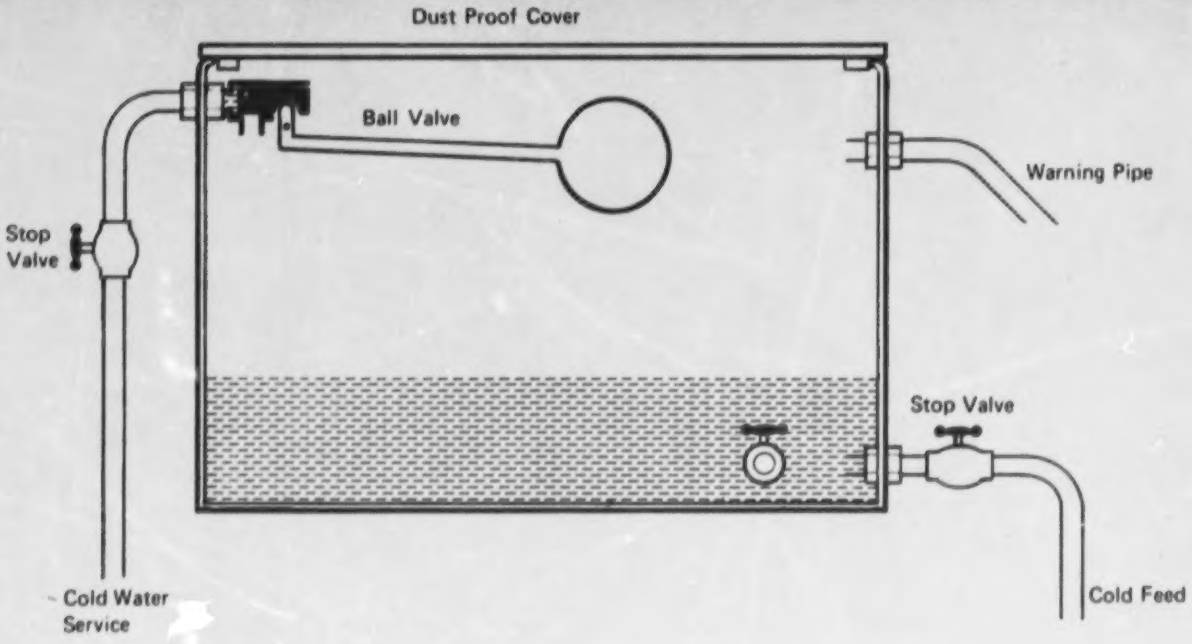
2 What would the effect be?


Dust Proof Cover
Warning Pipe
Ball Valve
Stop Valve
Stop Valve
Cold Feed
Cold Water Service

Problem 8

1 What is wrong?

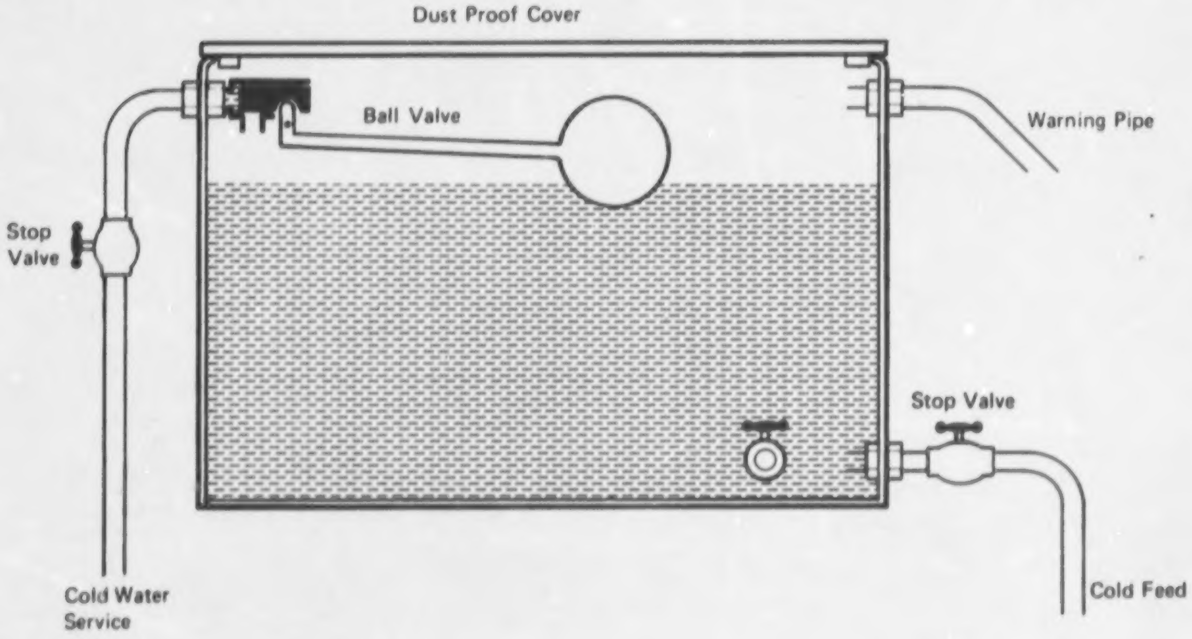
2 What would the effect be?


Dust Proof Cover
Ball Valve
Warning Pipe
Stop Valve
Stop Valve
Cold Water Service
Cold Feed

Problem 9

1 What is wrong?

2 What would the effect be?


Dust Proof Cover
Ball Valve
Warning Pipe
Stop Valve
Stop Valve
Cold Water Service
Cold Feed

Problem 10

1 What is wrong?

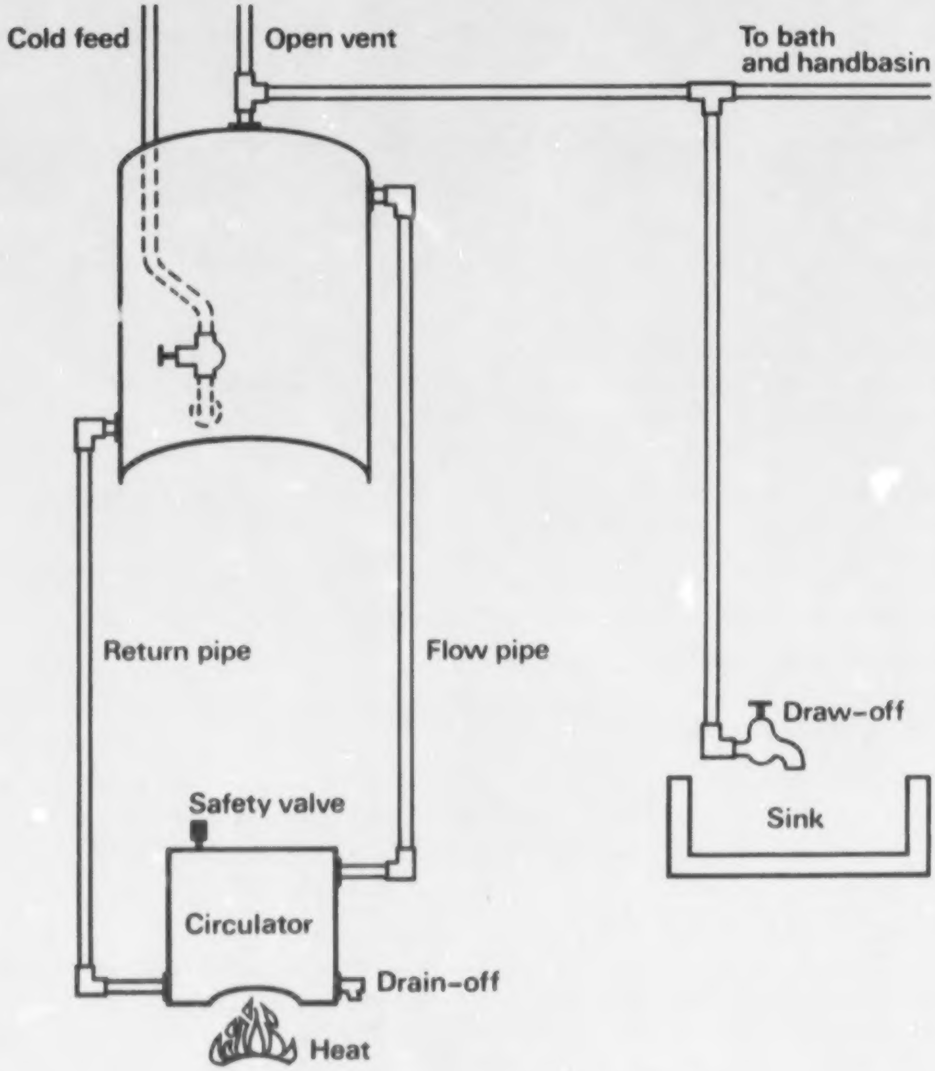
2 What would the effect be?

Faults – Answers for teachers only

1. (i) No warning pipe.
   (ii) Should the ball-valve fail to close for any reason, eg. scale deposit on the valve orifice, then eventually the water would flood over the top of the cistern.
2. (i) No inlet stop valve on cold water service.
   (ii) If an emergency arose (or to service the ball-valve) there would be no convenient way to shut off the water.
3. (i) No dust cover.
   (ii) Could give rise to contamination of the water due to air-borne bacteria, debris from roof or insects, etc.
4. (i) Warning pipe too low relative to water level.
   (ii) At normal water level in the cistern, water would run continuously from the outlet of the warning pipe.
5. (i) No outlet stop valve on cold feed.
   (ii) If it was required to service or renew parts of one cold feed supply then it becomes necessary to turn off the whole house if fed from the same cistern.
6. (i) Ball-valve submerged.
   (ii) A ball-valve defect is indicated (might be a leaky ball) because the ball float is submerged. Could also be ball-valve stuck down.
7. (i) Warning pipe feeding back into the tank.
   (ii) This would be ineffective in relieving a flood situation.
8. (i) Ball-valve set too low relative to warning pipe.
   (ii) This considerably reduces the useful storage capacity of the cistern. (Could also give rise to the same problem as in No. 10.)
9. (i) Ball-valve stuck.
   (ii) Another ball-valve defect (could be the ball-valve plunger seized in the barrel)—the ball has not dropped with the water level and eventually the flow of water from the cistern will cease.
10. (i) Warning pipe set too high relative to ball-valve.
    (ii) Before the warning pipe comes into use (in the event of stuck ball-valve) the water inlet will be under water and back syphoning could occur if, for emergency reasons, the water supply is turned off at the district mains. In addition, the time delay, or spare capacity, before water runs from the warning pipe will be reduced.

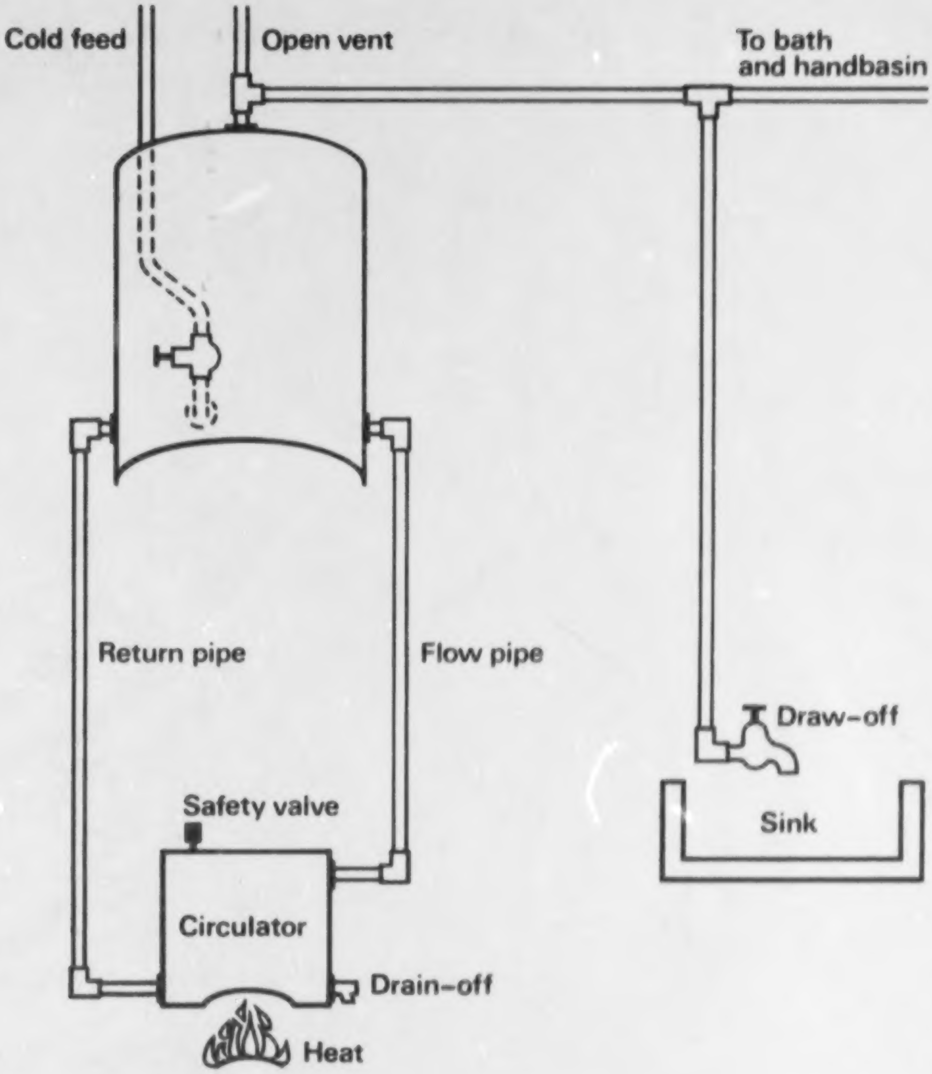
Gravity Hot Water Circulation

This is a system used for providing hot water in a building.
In this system circulation is based on gravity: the fact that water expands when it is heated, becomes lighter and rises.


Cold feed
Open vent
To bath and handbasin
Return pipe
Flow pipe
Draw-off
Sink
Safety valve
Circulator
Drain-off
Heat

This diagram is correct.

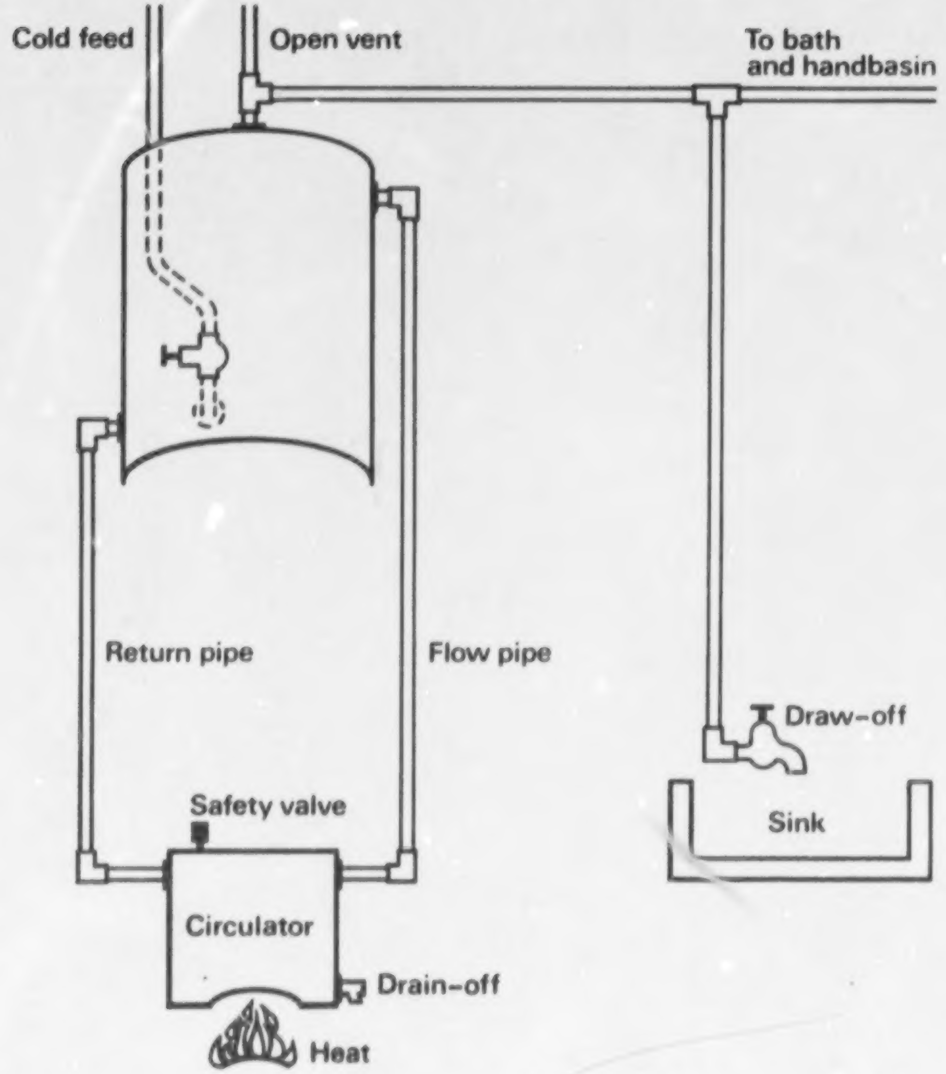
Gravity Hot Water Circulation


Cold feed
Open vent
To bath and handbasin
Return pipe
Flow pipe
Draw-off
Sink
Safety valve
Circulator
Drain-off
Heat

Problem 1

1 What is wrong?

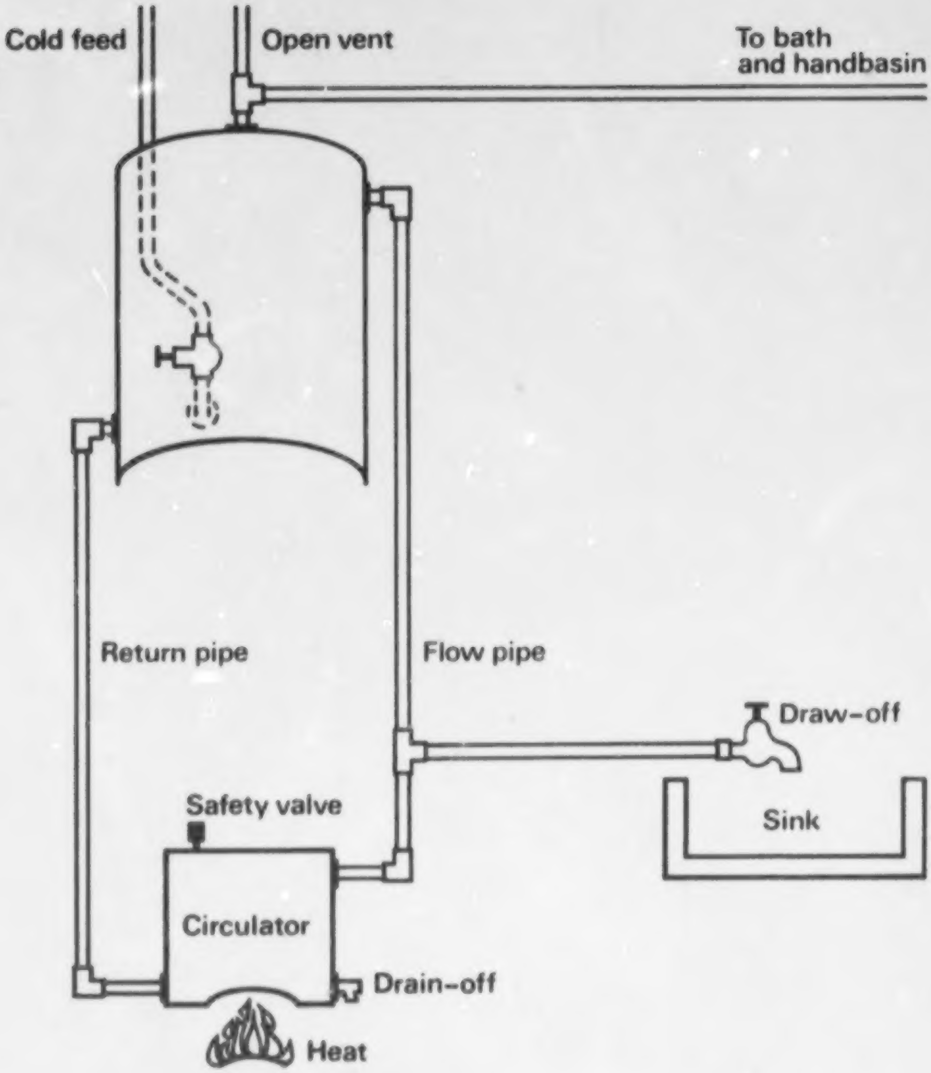
2 What would the effect be?


Cold feed
Open vent
To bath
and handbasin
Return pipe
Flow pipe
Draw-off
Sink
Safety valve
Circulator
Drain-off
Heat

Problem 2

1 What is wrong?

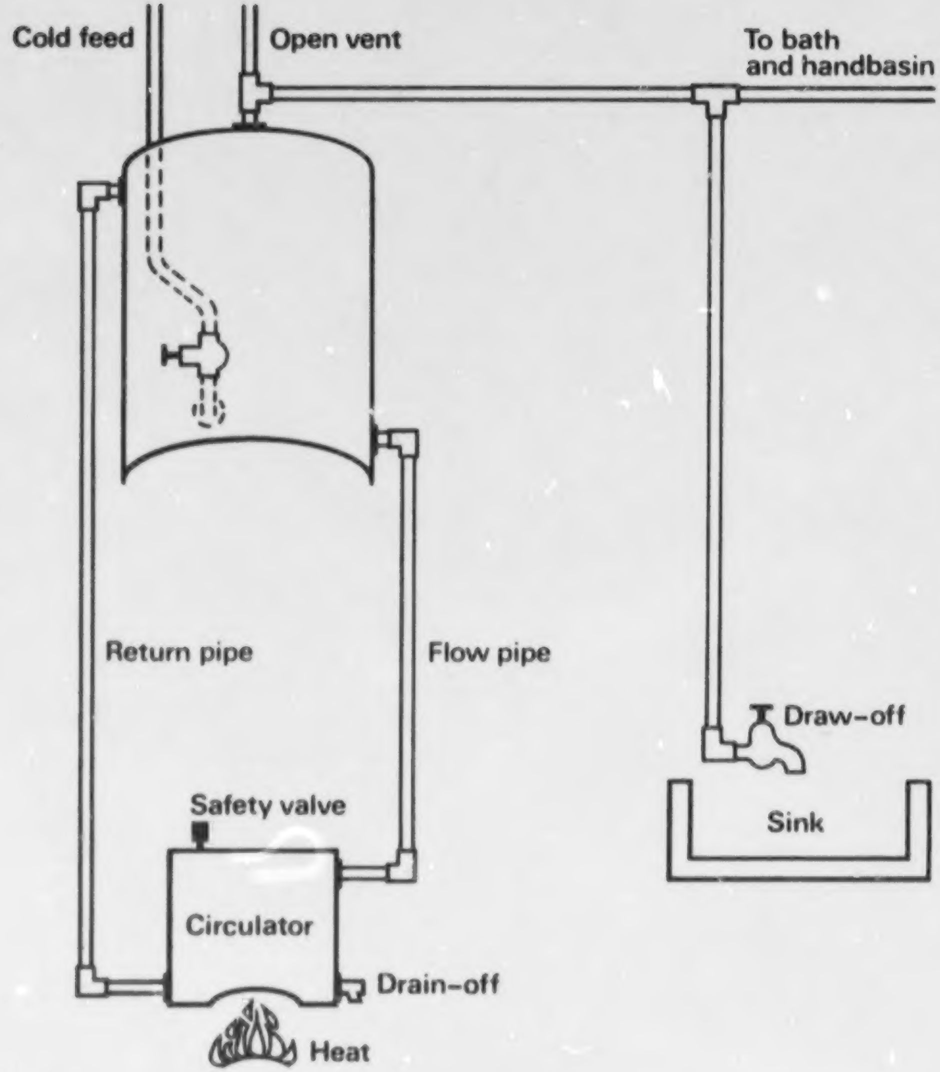
2 What would the effect be?


Cold feed
Open vent
To bath and handbasin
Return pipe
Flow pipe
Draw-off
Sink
Safety valve
Circulator
Drain-off
Heat

Problem 3

1 What is wrong?

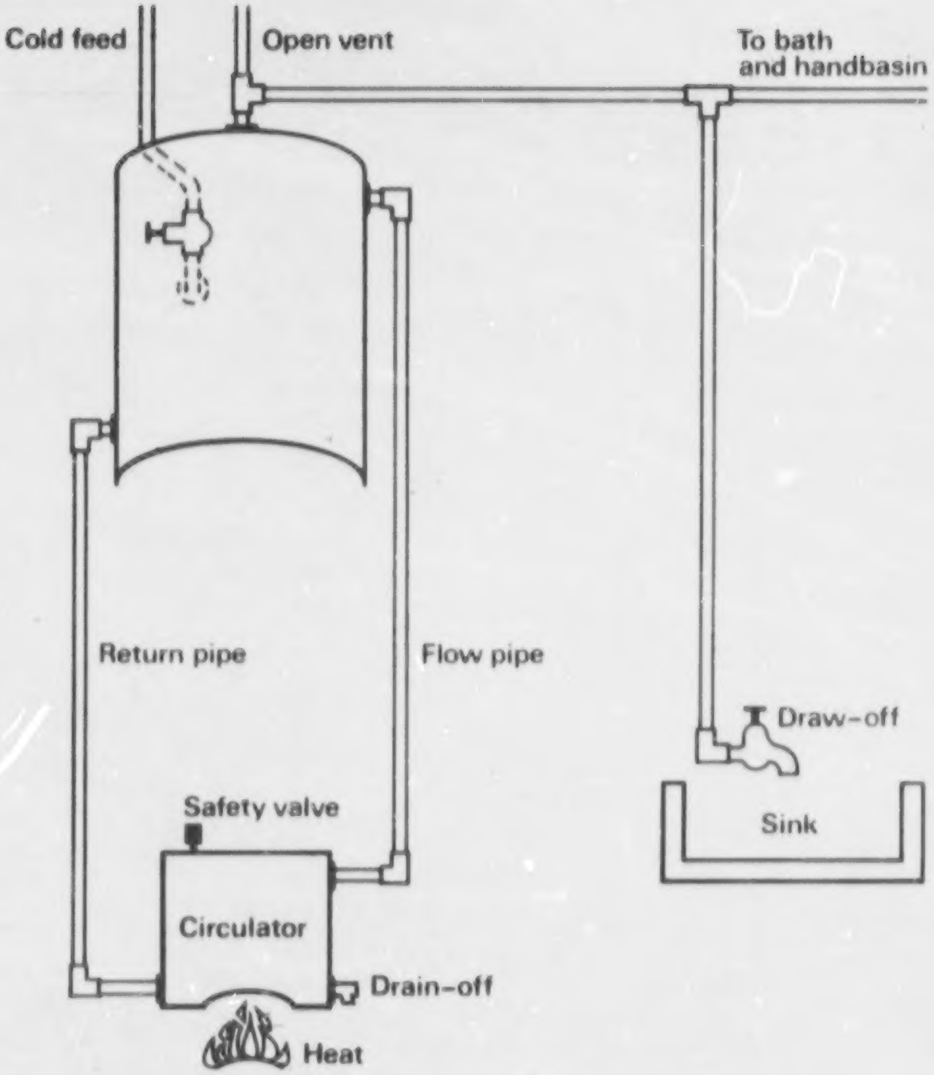
2 What would the effect be?


Cold feed
Open vent
To bath and handbasin
Return pipe
Flow pipe
Draw-off
Sink
Safety valve
Circulator
Drain-off
Heat

Problem 4

1 What is wrong?

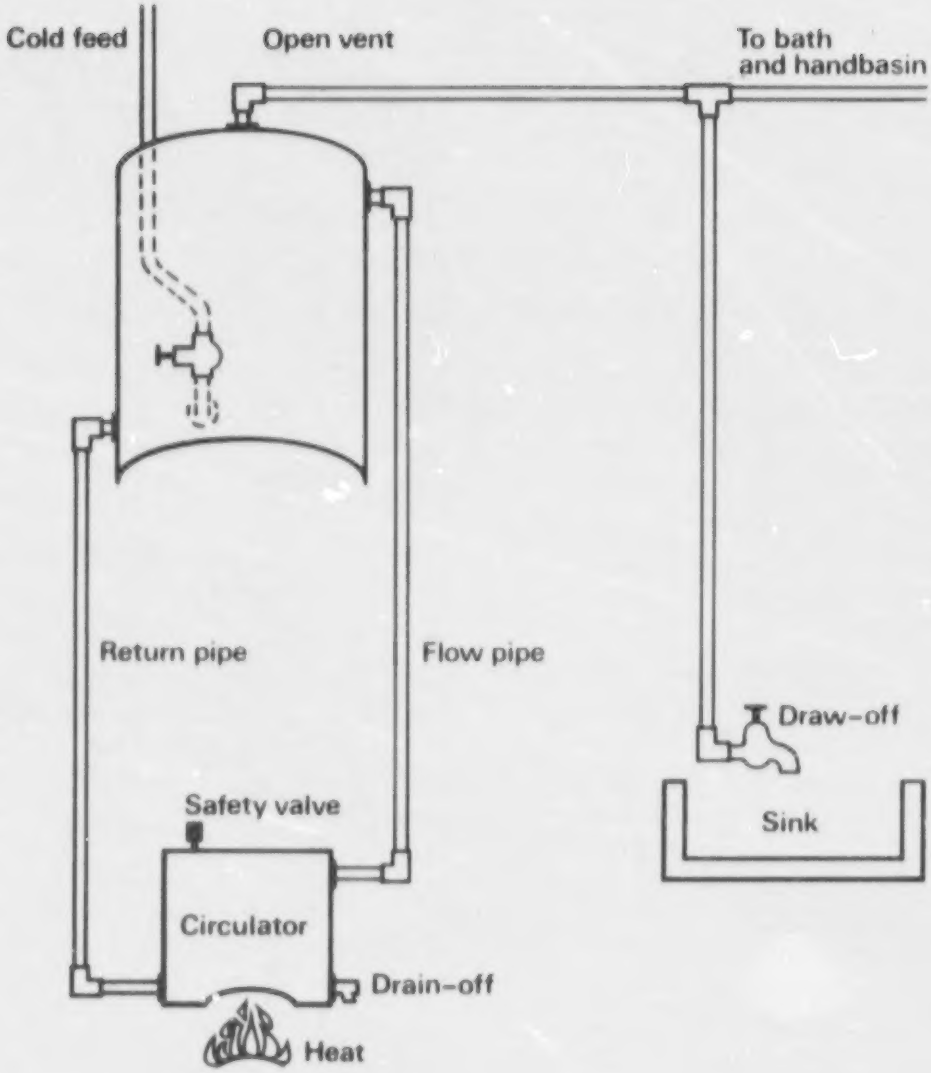
2 What would the effect be?


Cold feed
Open vent
To bath
and handbasin
Return pipe
Flow pipe
Draw-off
Sink
Safety valve
Circulator
Drain-off
Heat

Problem 5

1 What is wrong?

2 What would the effect be?


Cold feed
Open vent
To bath and handbasin
Return pipe
Flow pipe
Draw-off
Sink
Safety valve
Circulator
Drain-off
Heat

Problem 6

1 What is wrong?

2 What would the effect be?

Faults and effects of such faults

1. (i) Flow pipe connected to bottom of hot storage cylinder.
   (ii) Circulation will tend to occur across the bottom of the cylinder and the water in the top of the cylinder will remain cold.

2. (i) Return pipe has been fitted to the top of the circulator.
   (ii) This reduces the column of circulating water in the boiler.

3. (i) Sink tap teed-off flow pipe.
   (ii) (This lay-out is contrary to standing regulations.)
   This tap would drain the water in the hot storage vessel (in the event of no flow down the cold feed). It could also pull water two ways, from hot storage and also via the boiler return.

4. (i) Flow pipe connected to bottom of cylinder and return pipe connected to top.
   (ii) This may result in no circulation, although back-circulating is a possibility, ie. trying to circulate up the return pipe.

5. (i) Cold feed only going a small way down into the cylinder.
   (ii) Excessive mixing would occur between incoming cold water and stored hot water every time a draw-off tap was opened.

6. (i) System without open vent.
   (ii) There would be no exit for generated air from heating the water – this would give rise to an air lock and prevent water flowing from the draw-off tap. It would also restrict easy expansion of heater water. More importantly, however, we have lost a most valuable safety feature should steam cavitation occur from overheating; this remains true despite the inclusion of a safety valve.

Problem-solving Exercise: Design of Experiment

Instructions for use

Students divided into pairs and given worksheet (page 87) and a hand-out describing five experiments (page 88). They are told that there is possibly no such thing as a perfectly designed psychological experiment as there are so many variables to take into account when dealing with human and animal behaviour. Therefore, the essence of designing these experiments is to be aware of all these variables and to acknowledge and deal with the important ones while leaving out those which will not alter the results in any significant way. The experiments they are given, some of which are based on actual experiments, all have flaws in their design, ie. variables the experimenters had overlooked. Although the experiments are described only briefly all the information the students need to know is included.

They are given sufficient time to go through the five experiments and try to discover the flaws. They are then asked to write some general notes on what they have learned about research design. If the students have time left they are asked to think of alternative ways of designing the experiments in order to improve them.

The tutor then goes through their general notes on research design and develops general concepts with them. The individual experiments are then discussed (for teacher's notes see page 90). The group then discusses the findings, and how experiments might be improved.

Name .... Date ....

1. Experiment 1: 'Carrying out a Survey'. What had the research designers overlooked?

2. Experiment 2: 'Hawthorn'. What had the research designers overlooked?

3. Experiment 3: 'Which came first . . . ?'. What had the research designers overlooked?

4. Experiment 4: 'Who's for orange juice?'. What had the research designers overlooked?

5. Experiment 5: 'Learning a poem'. What had the research designers overlooked?

6. General notes on research design.

Description of Five Experiments

1. **'Carrying out a survey'** (one mistake)

A local Conservative political party wished to find out the views of the people on the question of 'a woman as prime minister'. They sought help from an agency specialising in this kind of survey. Together a questionnaire was devised which would be read out to those being interviewed.

The agency provided experienced 'interviewers' and gave them instructions on how to go about these particular interviews. The women who did the interviewing were known not to have strong political bias. They carried out their survey in shops, outside football matches and outside cinemas when people were queueing. Half of the interviewees were women and half men. This was thought to be a fair representation of the general population.

The results showed an overwhelming agreement in having 'a woman as prime minister'. The Conservative party officials were delighted with the result as the general election was pending: should they have had reservations?

2. **'Hawthorn'** (one mistake)

Some years ago in America, research was carried out to try and find the optimum working conditions for staff in an electrical factory. The criteria was the satisfaction of the staff in the working environment and the level of production.

A group of girls were selected and agreed to take part in an experiment; to work under several different conditions. They experienced changes in temperature, lighting, tea breaks and working hours. The findings were surprising: whereas increased lighting and adequate heating brought forth an expected increase in production, so production also went up even when lighting was reduced to candle light and when the temperature was kept really low.

To the best of their ability the researchers had followed all the recognised rules of good research design. But they had, in fact, overlooked something important. This omission has had a great bearing on future research, and was thereafter called the 'Hawthorn Effect'. What had they overlooked?

3. **'Which came first: the chicken or egg? Poverty or alcoholism?'** (one mistake)

In one town there was concern over the rate of alcoholism in males. Debate centred around whether this was precipitated by poverty or whether the poverty was a result of money spent on alcohol. The social services supported the former school whereas the church elders claimed the 'demon' drink was to blame.

However, cooperation between the two schools of thought lead to a survey to elicit the answer. They interviewed the individuals concerned as they came in for their social security benefits. They asked those men who were known to have a drink problem if they would mind helping the researchers with their survey, assuring them that the information given would be confidential and no details of their names, etc. would be taken.

Groups were matched as far as possible by taking those who agreed to help and placing them alternatively with the two interviewers. Group 1 was interviewed by a social worker while Group 2 was interviewed by a church representative. The interviews followed a similar pattern. They were to ask a list of questions and take down the responses given: if necessary helping them to overcome any reluctance. The interviewer in this way gradually elicited which was the first problem of the individual, drink or poverty. In all 200 males were interviewed.

Results were:—

	Poverty blamed	Drink blamed
Group 1	75	25
Group 2	35	65
	110	90

Decide for yourselves whether the researchers were able to state that roughly half thought that the poverty lead to alcoholism and the other half thought that spending money on alcohol lead to poverty. Were they justified in claiming this?

4. **'Who's for orange juice?'** (one mistake)

Much has been written about the cognitive development of children. One researcher hypothesised that very young children cannot understand the relationship between width and depth. He claims that they tend to choose orange juice contained in a tall thin glass rather than a short wide glass, even though the orange juice contained is the same: and that the choice is made on the child thinking that more is contained in the tall thin glass.

In his experiment, individuals in a school class were invited to take a glass of orange juice from various sized glasses. On each trial the positioning of the glasses was rearranged. The children were asked to choose individually so that they would not see the choice of any other child.

Results showed that nearly three-quarters of the children chose the tallest glass, thereby supporting the hypothesis. What is the drawback with an experiment of this kind?

5. **'Learning a poem'** (three mistakes)

An experiment was carried out to find out which of two methods was the best way of learning a poem. Students were divided into two groups: Group A comprised 10 people (5 males and 5 females) from the English Department and Group B comprised 12 people (7 males and 5 females) from the Engineering Department. Groups were matched according to age and academic qualifications.

In order that each group would be motivated to learn a poem, they were given a chance of selecting one themselves. They were to learn eight lines (lines comparable in length). Group A chose from 'Spike Milligan's Poems' while group B selected from 'Shakespeare'.

Group A was instructed to learn the poem in any way they wished while Group B were asked to learn the poem two lines at a time, and only when they had learned the two lines to go on to the next two. They were all given 15 minutes to learn the poem. After 15 minutes they were asked to write the poem down from memory: the results were collected.

Results showed that Group A did significantly better than Group B. The researchers concluded that leaving the students to decide their own styles of learning was more effective than giving them a style. What do you think?

Experiments – Answer sheet for teacher only

1. 'Carrying out a survey'

The interviewer is never a neutral person to the interviewee. Many psychologists believe that the most neutral type of person is a middle-aged caucasian woman. However, bearing in mind the particular question, it would have been better to have used both males and females as interviewers. In this way, any difference in answers given to male and female interviewers could be monitored.

2. 'Hawthorn'

'The Hawthorn Effect' means that if you treat people as special you will get 'special' behaviour. These girls were shown much more interest than the others in the factory and as such reacted and worked much harder. It would be unwise to assume, however, that reducing lighting and temperature in a normal environment would have brought forth similar results.

3. 'Which came first: poverty or alcoholism?'

It is impossible for any interviewer to be completely objective in any survey where answers need to be interpreted. We often unconsciously elicit the information we want from the interview and not always necessarily what is there. The more biased we are one way or the other to begin with, the more the likelihood of this happening. The social workers tended to claim that poverty came first whereas the church elders claimed that alcohol was the first problem. One safeguard would have been to have employed outsiders who were experienced in interviewing but with no preconceived ideas on the subject.

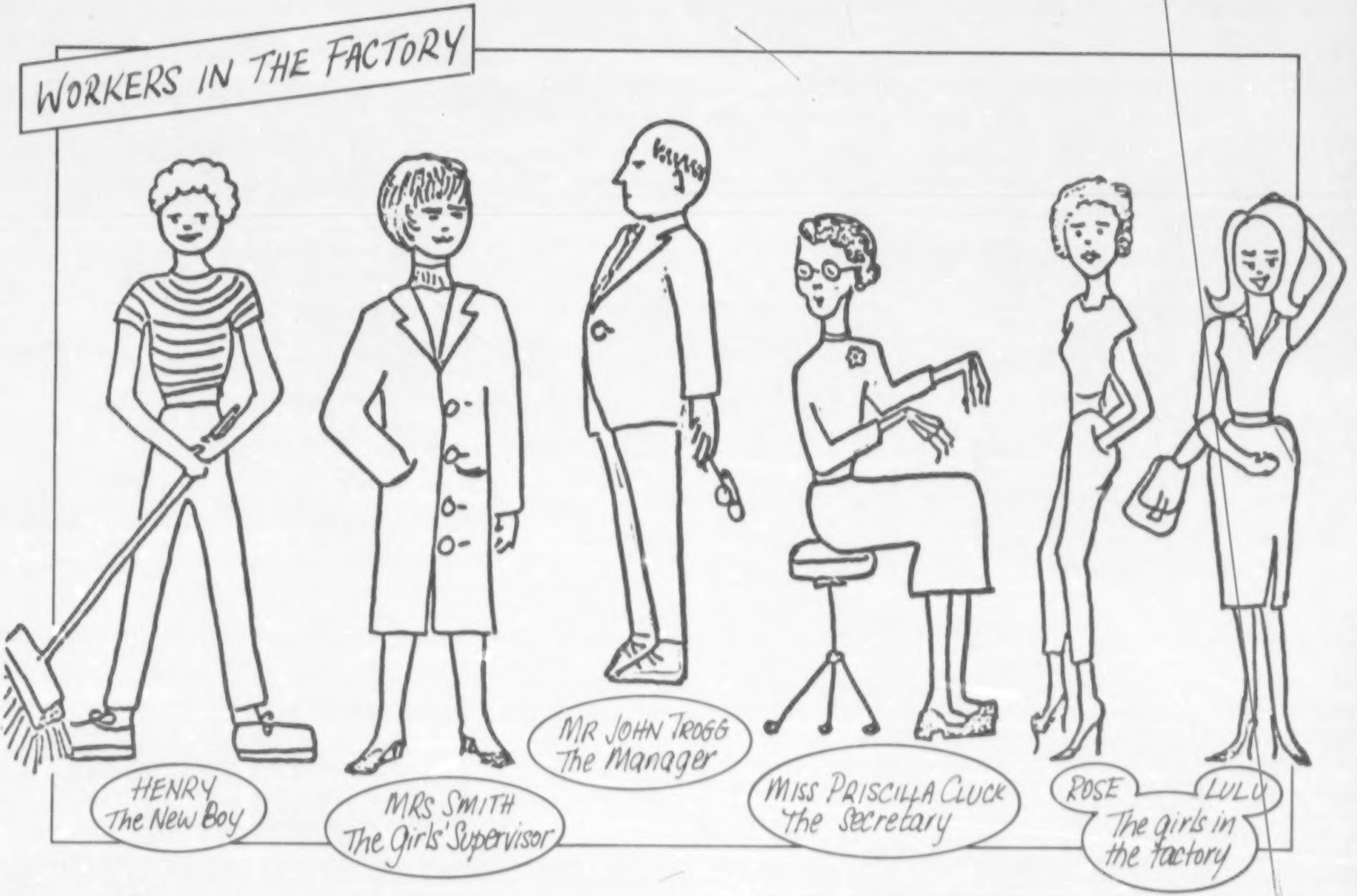
4. 'Who's for orange juice?'

In this experiment orange juice was used in the selection of different shaped glasses – but we don't actually know that every child regarded orange juice as a positive thing. It might be that they didn't like orange or that for the moment they didn't want to drink orange juice.

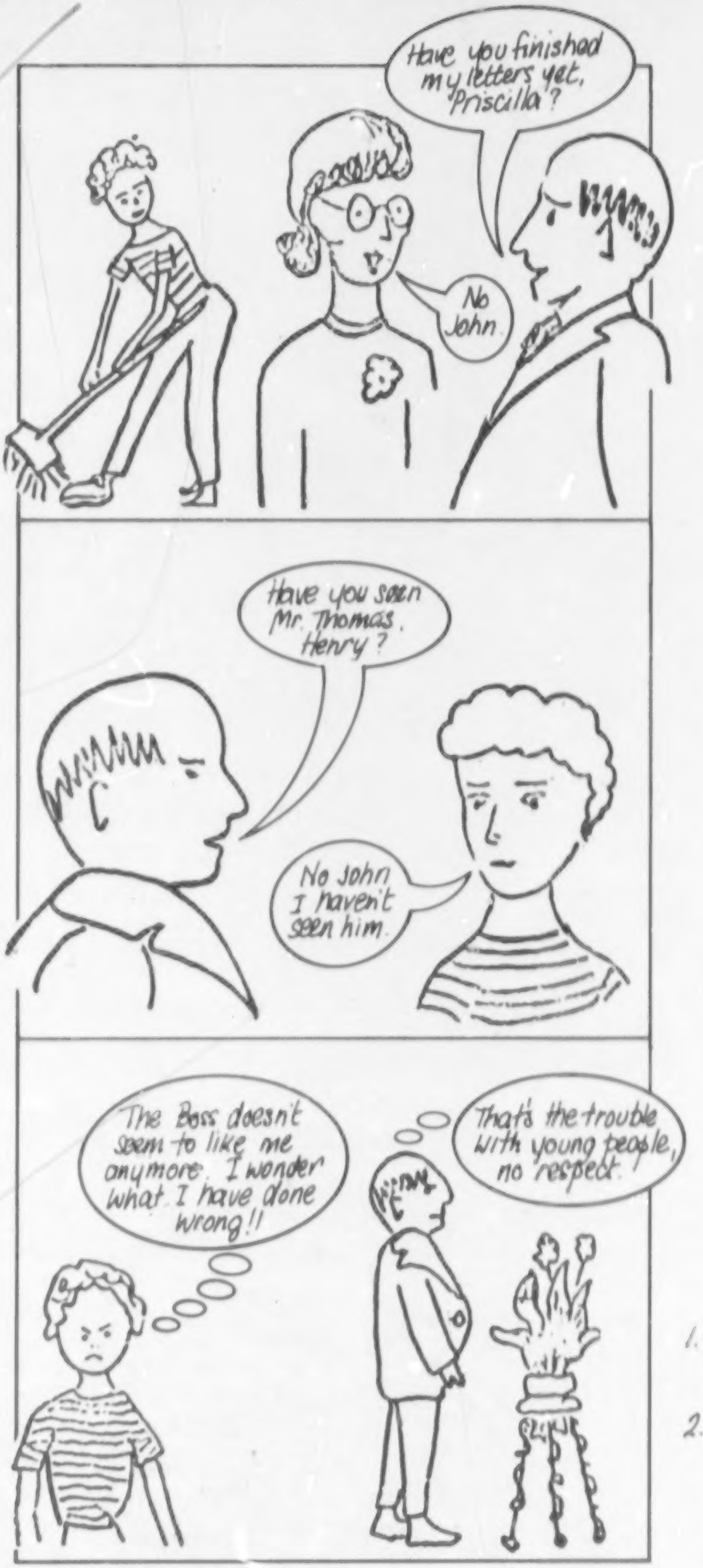
Many experiments are based on a reward system, but there must always be caution taken as to what is a 'reward'.

5. 'Learning a poem'

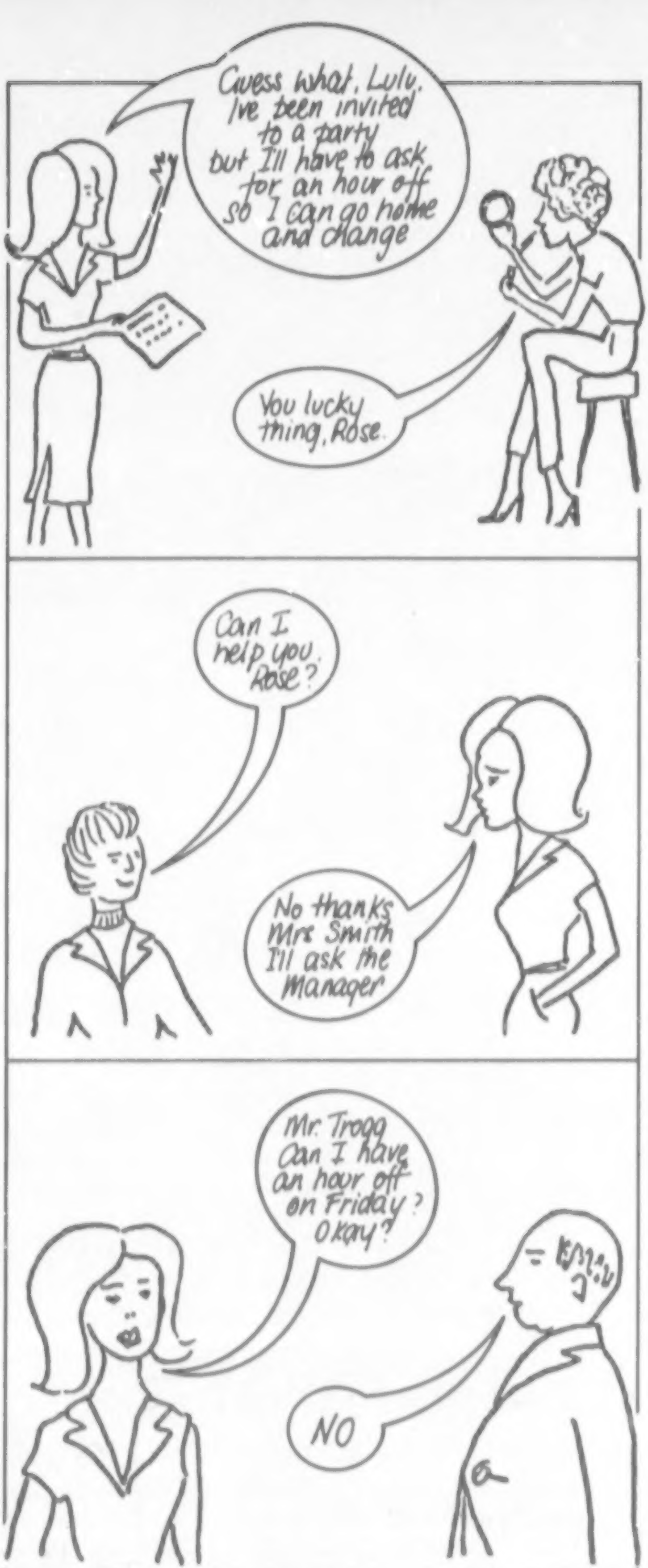
(i) Although groups were matched for age and academic qualifications, they came from quite different faculties and therefore are potentially different samples; especially regarding the interest shown in poetry. It would have been easy to have split the groups in half so that they each contained half of the English students and half of the engineering students.
(ii) Choosing a poem in a group did not ensure that every member would have the same amount of motivation to learn it.
(iii) Although the two poems had lines of similar length there was no control for familiarity of words or complexity.



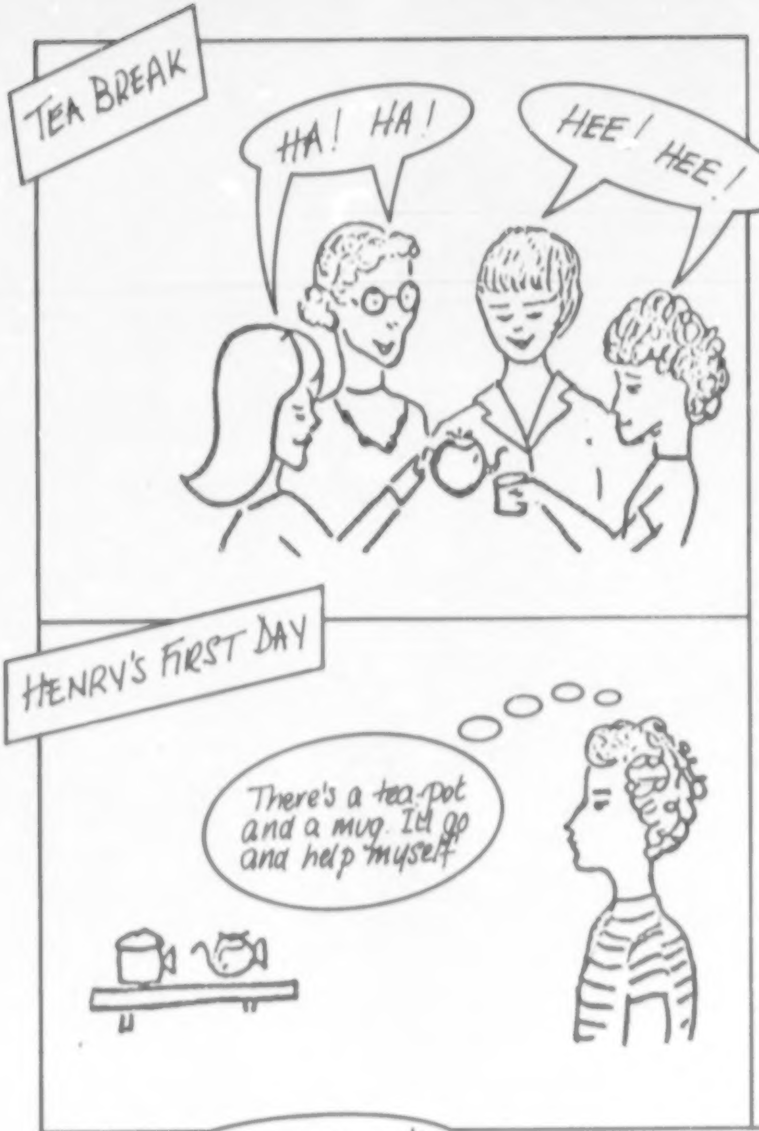
WORKERS IN THE FACTORY
HENRY
The New Boy
MRS SMITH
The Girls' Supervisor
MR JOHN TROGG
The Manager
MISS PRISCILLA CLUCK
The Secretary
ROSE
LULU
The girls in the factory


Have you finished my letters yet, Priscilla?
No John.
Have you seen Mr. Thomas, Henry?
No John I haven't seen him.
The Boss doesn't seem to like me anymore. I wonder what I have done wrong!!
That's the trouble with young people, no respect.

1. What did Henry do wrong?
2. Why do you think the Boss was annoyed with Henry and not with his secretary?

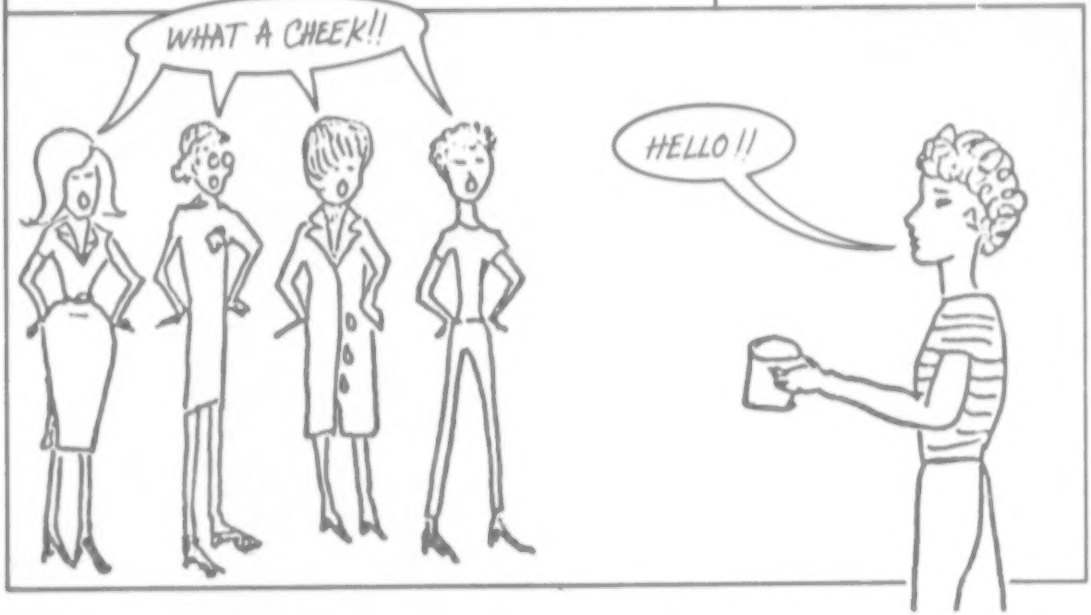

Guess what, Lulu, Ive been invited to a party but I'll have to ask for an hour off so I can go home and change
You lucky thing, Rose.
Can I help you, Rose?
No thanks Mrs Smith I'll ask the Manager
Mr. Trogg Can I have an hour off on Friday? Okay?
NO

1. Why do you think the Boss said "No"?
2. What could she have done to get the time off?


TEA BREAK
HA! HA!
HEE! HEE!
HENRY'S FIRST DAY
There's a tea-pot and a mug. I'll go and help myself

The Boss told Henry to go and get some tea.

1. How did Henry put his foot in it?
2. Why did they not welcome him?
3. What should he have done?


WHAT A CHEEK!!
HELLO!!

Henry and Rose seem to make many mistakes without meaning to. Henry gets fed up and leaves the job, so does Rose.

They apply for new jobs and are determined to do better.

What things would you suggest they do so they don't make so many mistakes in future?

1. Henry overhears the Boss talking to the Secretary. He hears them use each other's first names. He then thinks that it is all right for him to use their first names.
They get upset when he does this.

Discuss: why they got upset;
why it was different for Henry when he used their first names;
how he could have found out what to do beforehand.

2. The Boss probably got cross because:—

(i) Her request should have been made to the supervisor who is in charge of her.
(ii) Rose assumed that this would be all right without even waiting for the Boss to say anything.
(iii) She should have explained more fully what the reason was.
(iv) She could have offered to work some other time to make up.

Discussion should try and bring out these points, but also to introduce the fact that in some firms it is accepted that Rose might go straight to the Boss. Try and bring out how the young person might find out what to do before putting her foot in it.

3. Henry should have found out whose tea it was, and whether it was all right to use the mug. People often get attached to their own special mug. Also there might have been some payment necessary.

Discuss the above points and try to get them to say what Henry should have done.

Get them to write down on the worksheet what things they need to do when they start work to avoid making silly little mistakes that upset people. (Not just these problems but any problems which may arise.)

Torquay Towers Hotel

The Torquay Towers Hotel is in a beautiful situation near the beach with good views from all bedrooms. Years ago it was a very good hotel but during the past few years it has earned a bad reputation. Mr. Green is the new manager and he wants to make it a good hotel again by improving its organisation.

Here are some things he has noticed and the suggestions made by various members of the staff to improve matters. **Unfortunately, none of their suggestions was effective.**

Working in pairs, think out reasons why the staff suggestions would not solve the problems, and write down these reasons. What other suggestions would you make to Mr. Green?

1. Trouble in the kitchen

Mr. Green visited the kitchen to watch how the staff coped with the busy evening meal. All the preparation was complete and the cooks were ready to cook the hot meals as the orders came. Despite an orderly start, within half an hour of the meal beginning, the place was in chaos. People were bumping into one another, dishes piled up and everybody got in everybody else's way. Mildred, who washes up, complained that she had to stop washing up in order to open the door for the waiters who were carrying lots of dishes in and out. The waiters complained because they had to kick the door to get Mildred's attention when they were carrying piles of dishes. She often didn't hear because of the noise.

A staff meeting was held and everybody aired their views.

George, the Head Waiter, suggested that half the waiters should use the other door.

Flo, who loads the crockery on to trays, said she would open the doors.

Maurice, the Chef, suggested swing doors.

Harry, the odd job man, suggested propping the doors open when meals were being served.

Mr. Green drew up a plan of the kitchen (see attached) and went away to think about it.

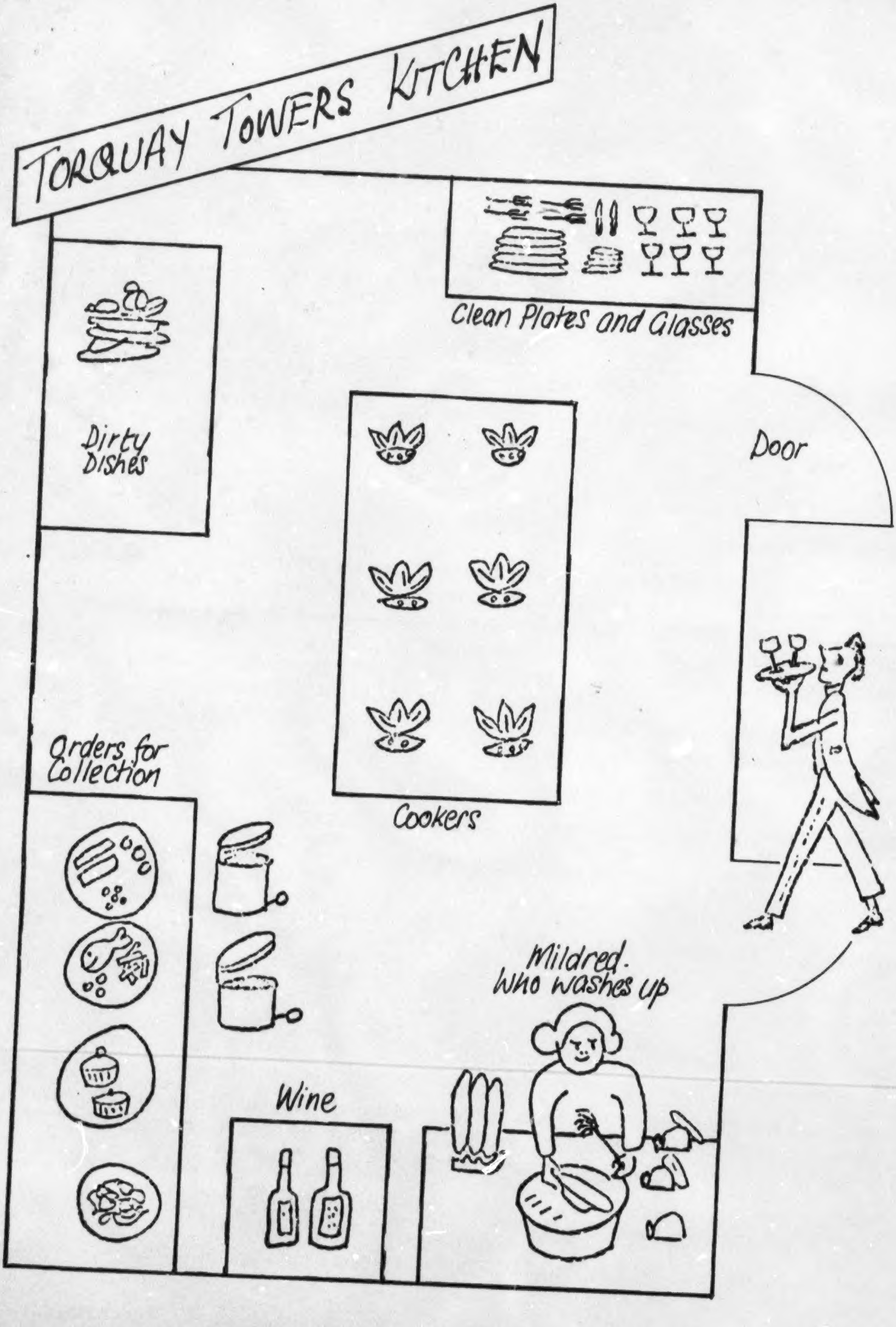
2. Bargain weekends

Mr. Green thought it would be a good idea to organise Cheap Weekend Bargains in the winter. This would keep the staff employed and avoid closing down the hotel. He held a staff meeting and asked for suggestions as to ways in which the cost could be reduced.

Maurice, the Chef, suggested that the Bargain visitors paid extra for their afternoon teas, which could be paid for when teatime came.

George, the Head Waiter, suggested that as flowers were expensive the Bargain visitors would not have them on their tables.

Mrs. Gibson, the Housekeeper, suggested nylon sheets for their beds which would be cheaper to launder


TORQUAY TOWERS KITCHEN
Clean Plates and Glasses
Dirty Dishes
Door
Cookers
Orders for Collection
Mildred. Who washes up
Wine

Mr. Green said he would think about these suggestions. Mr. Green liked to keep the standard of the hotel high at all times and wondered whether he should expect to make as much profit with the Bargain Weekend visitors as he made from other guests.

What are your suggestions?

3. Ring for the maid

Mr. and Mrs. Davis had at last arrived at the hotel and were changing for the evening meal. While Mr. Davis started shaving, Mrs. Davis started unpacking. She went to put the light on and pressed the wrong button. A loud buzzer went off in the corridor. 'Trust you' said Mr. Davis, 'You've called the maid'. But, in fact, the maid did not come.

When they mentioned this to the waitress she said this was all right as everybody makes mistakes because the two switches were close together and that no notice was taken unless somebody rang twice.

Everybody dining at their table joined in.

Mr. Gillespie said that when he wanted the maid he always rang three times and the maid came so there wasn't any problem.

Mrs. Gillespie said that although the switches were close together one had a little word 'Call' on it.

Nobody seemed to mind. Did Mr. Green have a problem to solve or should he see to more important things going on in the hotel?

4. Colonel Gruff

Colonel Gruff was an old gentleman who came to the hotel every year. He arrived at reception on the first evening, had his meal and went to bed. The next morning he went down to get a paper and was told by the Porter that as he hadn't mentioned this the night before, it had not been ordered and, therefore, there wasn't one for him. Colonel Gruff said that they should know what paper he liked since he had been coming to the hotel every year since the war. He went away grumbling that things weren't the same any more.

When the staff met for their tea break, the incident was mentioned.

Alfred, the Porter, said that if they can't be bothered to order it the night before, how was he to know what to order.

Tina, from reception, said that as he came every year perhaps a record could be kept.

Alfred said that he couldn't be expected to go around getting the orders the night before from all the new arrivals: and that there was no point in keeping a record because people might change their mind from year to year.

They all decided that they would have to be firm with visitors like Colonel Gruff but always making sure that they were very polite.

Mr. Green heard about the incident. When he mentioned it to Tina she said that situations similar to this had happened a few times. For instance, she said visitors complained that they got no morning tea.

What should be done about these two types of incident?

5. Late arrivals

Mr. and Mrs. Crockhampton from America arrived at the hotel late one evening and went to reception. They explained that their plane had been delayed and, therefore, they needed a bed for the night. Mr. Crockhampton asked whether it was possible to stay the night at Torquay Towers. 'Certainly' said Doreen, 'but the beds need to be made up – can you go and have a

An hour later they were told their rooms were ready. Mr. Crockhampton had a shower and was upset to find that there were no towels. He later complained but was politely told that as they had booked in very late things were complicated. He was told that the person in charge of the linen had gone off duty and they had trouble finding the key.

This caused a row later in the kitchen, where staff were having a cup of tea.

Agnes, who was in charge of the linen, said 'I go home at midday after doing up the beds listed. I am not going to be responsible for the linen if I leave the key with somebody else'.

Gloria said that they shouldn't accept late bookings if rooms weren't ready.

Maureen said that she didn't mind making up beds sometimes but said she should have a key.

Mr. Green saw all their problems but wondered if there was a suitable solution.

Learning to Understand something

Examples of essay subjects which involve understanding of the topic

For each example students should be asked to list a number of questions, the answers to which would help them plan the essay.

1. 'Adequate sociological explanations of suicide are rendered impossible by the dubious nature of suicide statistics.' Discuss.
2. Has the breathaliser reduced road accidents?
3. Should we believe what we read in the newspapers?
4. Why should people work?
5. Why should there be a renewed interest in nuclear power?

Example of an inadequate demonstration of a task

Making peppermint creams

The demonstration should take the following form:—

1. Sift the icing sugar, **without mentioning how much there is in the recipe,** through the sieve or strainer into a bowl.

2. Separate an egg and put the white in the bowl with the sugar. (The yolk will not be needed in this recipe.)

3. Mix with a wooden spoon, and then knead strongly with your hands.

4. Squeeze the half lemon on a squeezer, and add the lemon juice, drop by drop, until the mixture binds together comfortably and takes on a pliable, not stiff and crumbly, consistency. **Do not indicate this as the measure of how much lemon juice to add.**

5. Add peppermint essence, drop by drop. **Up to half a teaspoon is sufficient for most taste, but do not indicate how much you use.**

6. Add sufficient green colouring to give a light to medium green shade to half the mixture.

7. Press out the two colours separately with the fingers on a cold surface.

8. Cut into shapes with a cutter or knife.

Teacher's note.
Ingredients:—
1 lb icing sugar
1 egg
Half a lemon
Up to half a teaspoon peppermint essence
Drops of green colouring (optional)

A REVIEW OF THE LITERATURE

Introduction

1. **Analysing the learning process**
    - i. Taxonomies of learning: some examples
    - ii. The use of taxonomies in practice
    - iii. Task analysis – an alternative approach?
2. **Variations in individual abilities and approaches to learning**
    - i. Individual differences
    - ii. Learning strategies
    - iii. Learning styles
3. **The relationship between requirements of the task and learner characteristics**
4. **Implications for the project**

Introduction

Before the pilot induction course was designed a review of the literature of this complex field was carried out in order to:—

i. make a collection of information on ways of learning and their relationship to individual characteristics; and

ii. make an appraisal of the relevant research in order to arrive at principles for guiding the design of an experimental induction course for young people.

Section 1 of the Appendix discusses several different methods of analysing learning and what is involved in using such methods of analysis in practice.

Section 2 is concerned with a review of research into individual differences, learning styles and learning strategies, the latter two being closely connected in practice.

Section 3 discusses the extent to which one should take account of individuals' learning preferences, abilities and styles in order to help them learn effectively. The feasibility of doing this is considered in relation to the fact that the requirements of a particular learning task might mean that some ways of learning are more appropriate than others.

Finally in section 4 there is a brief discussion of directions the project might take in order to communicate to the target group current thinking about the nature of learning.

Section 1.

Analysing the learning process

i. Taxonomies of learning: some examples

One of the difficulties about classifying learning is deciding what to classify. What goes on while learning is taking place apparently goes on in the learner's head, but mental events are not very accessible and sometimes not accessible at all. Most investigators who face this problem make the focus of their researches the observable behaviour of the individual. Thus Gagné (1977), who defines learning as 'a change in disposition or capability, which persists over a period of time, and which is not simply ascribable to processes of growth', describes the subject of his investigation as the kind of observable changes in human behaviour which 'justify the inference of learning'. The consequences of this approach are that the objectives of learning are stated in terms of what the learner is expected to be able to do after learning has occurred, and the question of whether learning has occurred or not similarly is answered by reference to the learner's performance, compared either with previous performance or with expected performance as described in the learning objective. This can be described as 'a learning outcome'.

While having this approach in common, investigators differ in the type of classification they adopt and the purpose to which they put it. Bloom (1956), for instance, is interested in what he calls 'educational objectives', the aims of education stated in general terms, eg. 'The ability to translate an abstraction such as some general principle, by giving an illustration or sample'. Examples of such objectives are given in the form of test items which might be given to students in an examination. The purpose of carrying out this kind of analysis is curriculum design. De Cecco (1974), who objects that Bloom's educational objectives do not describe the desired outcomes (performances) of learning in terms which are specific enough, offers in their place instructional objectives which are in sufficiently detailed terms to be immediately amenable to task analysis. An example would be 'The student is able to name the planets of our solar system'. While De Cecco's criticism would be fair if Bloom's examples were intended as instructional objectives, De Cecco seems not to have understood that Bloom is dealing with learning at a more generalised and abstract level than he. What this difference of opinion points up is that, while discussion of learning is probably best conducted with reference to human performance, that performance does not necessarily have to be specified with reference to a small-scale learning task. Although testing of whether an objective has been achieved does have to be carried out with the individual on an example which is illustrative of the objective stated, it may also be valuable for different purposes to talk about learning outcomes at different levels of detail and abstraction.

Differences in the level at which learning is being considered help to account for differences in the category content of various taxonomies of learning. Melton (1964) and associates, for instance, offering a sketch for a taxonomy, are concerned with learning at the level of association formation; all their learning types, eg. classical and operant conditioning, rote-verbal learning and perceptual motor-skill learning, are accounted for in terms of stimulus-response theory. Gagné's 1965 version of a taxonomy similarly depends on behaviourist theory and its eight categories have much in common with Melton's seven; both exclude the learning of attitudes and values though they acknowledge that these also need to be dealt with. Bloom's (and Krathwohl's) taxonomy (1956 and 1964) are of educational objectives, already mentioned; they provide various categories of cognitive and affective learning, but offer nothing on motor-skill learning. Their Cognitive Domain has six main categories, each sub-divided; the Affective Domain has five, also subdivided. The CRAMP taxonomy (ITRU 1976) by contrast is a much simpler classification of five categories. These, however, cover attitudes and motor-skill learning where other taxonomies tend to exclude at least one. In comparison with other taxonomies the CRAMP handbook gives little attention to the theory on which the categories are based; it is a practical instrument for choosing between different types of training methods for different kinds of learning task, some of which are described in general terms in the handbook.

The main categories of each of these taxonomies are shown in Fig. 1 and the theoretical bias or practical purpose of each is indicated alongside. The various authors do not for the most part claim that their categories are mutually exclusive. Bloom's categories are arranged in a hierarchy, and complex educational objectives are likely to include simpler ones. Gagné's (1965) sees the acquisition of principles as being necessary to the process of problem-solving, and the CRAMP handbook (1976) makes the point that most tasks involve more than one type of learning. Each taxonomy is regarded as being capable of providing guidance on practical instructional or training issues. Apart from Melton's each of these schemes of classification is accompanied by detailed advice about how to use it. None of the authors envisages the use of the taxonomy as a simple off-the-cuff procedure; the user must become familiar with the handbook and consult it regularly.

Gagné's latest version of a taxonomy (1977) (Fig. 2), with its accompanying text, is more comprehensive than any of the taxonomies shown in Fig. 1 in that it attempts to account for all the types of learning referred to there, though sometimes

Fig. 1 Various taxonomies of learning

EDUCATIONAL OBJECTIVES

Bloom et al

	Cognitive Domain (1956)	**Affective Domain (1964)**
	Knowledge (9 subcategories)	Receiving (3 subcategories)
Intellectual abilities and skills	Comprehension (3 subcategories)	Responding (3 subcategories)
	Application	Valuing (3 subcategories)
	Analysis (3 subcategories)	Organisation (2 subcategories)
	Synthesis (3 subcategories)	Characterisation by a value (2 subcategories)
	Evaluation (2 subcategories)	

TRAINING INSTRUMENT

CRAMP 1977

Comprehension
Reflex skills
Attitude development
Memorisation
Procedural learning

BEHAVIOURIST THEORY

Melton et al (1964)

Classifical and operant conditioning
Rote-verbal learning
Probability learning
Short-term memory and incidental learning
Concepts
Perpetual motor-skill learning
Problem-solving

Gagné (1965)

Signal learning
Stimulus – response learning
Chaining
Verbal association
Multiple discrimination
Concept learning
Principle learning
Problem-solving

Fig. 2

Summary of Gagné's taxonomy of learning (1977)

Intellectual Skills

(Discriminations Concepts Rules)

Cognitive Strategies

Verbal Information

Motor Skills

Attitudes

under different names, and offers detailed theoretical justification of each category. He also attempts to show how, by the process of task analysis, instructional objectives can be related to the appropriate categories of learning. Gagné's theoretical position has changed in the period since earlier editions of his main text, 'The Conditions of Learning' (1965, 1970). His five main categories (1977) are now based mainly on information-processing theory. What is of particular interest in Gagné's new viewpoint is that he does not reject behaviourist theory but instead describes the classical behaviourist types of learning as 'basic forms of learning'. He says that Stimulus-Response learning is almost always involved in the learning of voluntary motor-acts, including utterances of speech. Simple learned motor-acts can be identified in young children, but not in adults. Reinforcement he sees as a powerful tool in the management of learning. Doubtless this attempt to marry information – processing theory with behaviourism is not the last word on these important theoretical issues. However, it seems an advance on other theoretically-based taxonomies in that it gives S-R learning a role without attempting to make it a complete model of the human learning process. Taxonomies which are based on this model (see Melton's 1965), are inadequate to the full range of the experience of learning. Similarly statements of the kind 'a principle is a chain of two or more concepts' (Gagné 1965) seem inherently odd; the categories of Concept Principle Learning and Problem-Solving are all described in similar terms in this version. On the other hand taxonomies like Bloom's (1956) which leave out motor-skill learning—which surely involve some S-R learning are also inadequate. Gagné incorporates aspects of S-R theory into his account of motor-skill learning and into his account of verbal learning at the initial stage of learning in young children. He no longer attempts to stretch it to less appropriate kinds of learning like the learning of rules.

Although it contains no explicit theoretical content, the CRAMP account of learning types appears to be equally catholic in its approach. The main differences between the two taxonomies are in their treatment of cognitive skills. In comparison with Gagné's several categories of cognitive learning, comprehension and memory alone seem rather inadequate. A simple explanation of this may lie in the types of learning which actually have to be dealt with in industrial training. There are other differences. Gagné, for instance, deals with procedural learning under the heading of motor-skills, and memory storage is seen by him as one aspect of information-processing which has relevance to all kinds of learning. It gets its most explicit treatment under the heading of Verbal Information Learning.

What conclusions can then be reached on the merits of these different systems? Gagné's 1977 version and CRAMP are the most comprehensive and Gagné's the most coherent theoretically. What is also clear is that most writers of taxonomies would not consider the headings listed in Figs. 1 and 2 as by any means adequate as explanations of what each of the different categories involves. It is, for instance, possible to understand the significance of Gagné's cognitive strategies only by reading his account of them and seeing how they relate to other categories.

Taxonomies of learning may have a number of different uses for the practitioner depending upon the kind of educational or task analysis (s)he is engaged in and also upon his/her existing state of knowledge. Their value for our purposes depends mainly on what kind of guidance a taxonomy might give on learning methods appropriate to different tasks. This question will be considered in the following paragraphs by reference to some of Gagné's categories as compared with learning methods advocated in the CRAMP handbook.

ii. The use of taxonomies in practice

One of the main purposes of producing a taxonomy of learning is to provide guidance on the types of learning methods appropriate to different kinds of learning. What kind of guidance is this likely to be and how much reliance should be placed on it? The answer to this question varies with the taxonomy.

Gagné groups together all factors influencing learning under the heading 'conditions of learning'; the changes brought about by learning are related to the situations, or conditions, in which they occur. These conditions he divides into two types: internal conditions in the learner, of which we can obtain knowledge from evidence of his/her existing capabilities, and external conditions. External conditions include all factors external to the learner which may initiate or influence learning. Each of the categories and sub-categories of learning is discussed under these two main headings.

Gagné's discussion of each category and sub-category with its appropriate conditions of learning is detailed and analytic, sometimes having reference to findings of other investigators, and at others summarising ideas about particular types of learning which by now are non-controversial. His discussion of motor-skill learning illustrates these characteristics. Hence he refers to dimensions of motor performance such as fine v gross, continuous v discrete and open loop v closed loop. The main learning method for motor-skills is practice involving repetition, plus feedback which provides information to the learner. There is also reference to the learning curve, the learning of part-skills and to the choice between massed and spaced practice. What complicates, and also strengthens his account is an explanation of the role of procedural learning in the acquisition of motor-skills. The ability to follow a procedure Gagné sees as an intellectual skill which involves following a rule-determining sequence. He also stresses the importance of cognitive learning in the early stages of acquiring motor-skills when the learner is trying to understand the task and what it demands.

The CRAMP account of Reflex Skills by comparison says much less about the characteristics of motor-skill learning, and, while it refers to situations in which R-Type Learning may be combined with Procedural or Comprehensive Learning, does not attempt to explain the connections as fully as Gagné does. The sections referring to learning methods appropriate to R-Type Learning, however, are basically in agreement with Gagné's account, though the emphasis is much more practical, with advice on the advantages and disadvantages of different training methods.

The same differences of approach

and emphasis are to be found if one compares different categories of the two taxonomies in respect of cognitive learning, and the matter is further complicated by the fact that Gagné has several categories which correspond approximately to CRAMP's one general category of Comprehension. Thus, for instance, Discovery Learning, which falls under Comprehension in CRAMP, is treated by Gagné under the heading of Cognitive Strategies because cognitive strategies are learned, according to him, as the result of problem-solving. Intellectual skills of other kinds – being able to make discriminations, understand concepts and rules – he discusses separately, and the conditions of learning he describes as being appropriate to them in practice could probably take the form of other categories discussed under the heading of Comprehension in CRAMP, eg. Test-books and Lectures, Basic Concepts. No such reasonable correspondence can be shown between certain types of learning method which CRAMP places under Memorisation and Gagné's categories. 'Rules, Deductive Method', given under Memory in CRAMP, would fall under Gagné's Intellectual Skills.

The CRAMP explanation of this would be that rules and the process of deduction can be used as aids to memory. The emphasis, in other words, is on how best to help learners achieve a given objective. The approach takes into account the learner's existing knowledge as well as features of the task, and gives advice mainly on a pragmatic basis. While it is made clear in the text when a training objective involves more than one category of learning, the handbook has no pretensions to providing a theoretical account of the nature of learning. It is intended as a practical guide to training decisions.

In summary we can say that Gagné's taxonomy provides very adequate guidance about the nature of learning at a theoretical level. His insistence on including the 'internal conditions' of the learner in any consideration of what are suitable 'external conditions' is extremely important if the objectives and methods of instruction are to be appropriate and thus effective. His treatment of each category and its conditions of

sistent and consistent with what he says elsewhere about other categories. The limitations of the work for practical purposes is that while the book is intended to be relevant to learning in a formal educational context, it has no particular educational focus. Although there are numerous examples of teaching or learning situations included alongside the theoretical discussion which they illustrate, the book is by no means a practical handbook of instructional methods. The work of relating a series of instructional methods suitable for a particular educational purpose to the categories of the taxonomy remains to be done. Moreover, while on the theoretical grounds the categories of the taxonomy appear to be valid, it takes time for a reader to understand and become familiar with them.

Although the CRAMP system is much easier to follow and provides a very useful algorithm as a means of guidance, it is intended as advice to practitioners, not as material suitable for laymen. Just as in the case of Gagné, the categories are not 'pure', and to see the point of the categories, while also understanding the references under each training method to other types of learning, requires at the least familiarity with training terminology.

Existing taxonomies of learning, therefore, can provide practitioners with greater understanding of the processes of learning or encourage them to consider a wider range of instructional methods than they have adopted so far. On the other hand classifications of this kind would not normally be considered suitable learning material for learners themselves.

An important additional point which emerges from the comparison of these two taxonomies concerns use of the phrase 'methods of learning'. While Gagné does not use the term explicitly, the events of instruction which he describes as appropriate in terms of internal and external conditions of learning could, for a particular type of an instructional objective, be described as THE 'method of learning' it. Such descriptions are conceptual and structural in kind, and a number of different methods of instruction – 'a teacher, a film, cr a textbook' – may be equally suitable provided the ex-

the category of learning and to the internal conditions of the learner. CRAMP, by contrast, is interested in 'methods of instruction', the lecture, the group, role-play as well as in the structure of different types of learning. It is important to keep clearly in mind these two uses of the term 'methods of learning'.

iii. Task analysis – an alternative approach?

Gagné and other writers who advocate use of his taxonomy do not suppose that a given learning task can be related directly to one of its categories. The task itself must be analysed into steps to reveal its procedural characteristics, ie. the sub-tasks and the order in which they must be performed. The link or sub-task must either be of a simple enough form to be identified with one of the categories of learning – as an intellectual or motor-skill for instance – or, if too complex to allow for this, be further analysed into component parts for which such identification is possible. Each of the individual skills thus pinpointed and identified becomes one of the instructional objectives for learning the task as a whole.

Gagné's analysis extends further. Having analysed an instructional objective by reference to the category of learning outcome, one asks what is required from the learner by way of internal conditions of learning. In other words, what must the learner already be capable of doing in order to be ready to learn the new task? If the required capabilities are missing, these must be learned or re-established by recall before there can be any hope of success with the new task. Appropriate external conditions of learning are implied by the category of learning outcome to which the instructional objective belongs, and are related to the internal conditions of the learner.

The chapters of Gagné's book which deal with task and learning analysis are some of the densest. They are rather repetitive and not always easy to follow. An alternative, simpler and more comprehensive account of learning task analysis is provided by De Cecco and Crawford (1974). They distinguish between 'school objectives', elsewhere called 'educational objectives' (eg. Bloom, ibid) and 'teacher' or 'student' expressed as instructional objectives. The value of this distinction is that it acknowledges that what the teacher thinks the student should learn and what the student wants to learn may not be the same. The technical point emphasised by De Cecco and Crawford about instructional objectives is that in order to be usable they must be expressed in behavioural terms, eg. the 'learner identifies, by naming, the root, leaflet, and stem of representative plants'. The full task description of the objective identifies the terminal performance required – as in the example just given – describes the condition under which the behaviour is expected to occur, and describes how good a student's performance must be to be acceptable. Each objective is then related to the appropriate category of learning. De Cecco and Crawford base their chapters dealing with each of these categories on the 1970 version of Gagné's taxonomy. A better alternative would be to refer to the 1977 version described in the previous section. In order to decide on appropriate conditions of learning (internal and external) for a particular category of learning, it would be necessary to read the whole of the chapter dealing with it.

Leach and Raybould (1977), who recommend De Cecco's and Crawford's method of analysing instructional objectives, describe how it was used in practice with an analysis of reading skills for primary school children. They suggest two stages of analysis: one of the skills needed in total, or in the long-term, in order to be able to read; another of the learning steps needed to master just one of those sub-skills. The next stage is to establish by testing and observation what relevant skills the student has already acquired. Teaching them takes the form of a series of carefully monitored 'mini-experiments'. In other words, the teacher tries out one at a time a number of different teaching methods emphasising different relevant strategies and evaluates the success of each in terms of the learner's performance; as a result (s)he either continues with a method which is fruitful, modifies it, or tries an entirely different method. The teacher's assessment of the learner's performance includes observation of relevant learning strategies, and one of his/her primary aims is to encourage in the learner use of strategies relevant to the target task. Leach and Raybould do not envisage this detailed method being used with the majority of children who master basic educational skills fairly smoothly. But they see it as a valuable approach when a child who clearly wants to learn is experiencing great difficulty in doing so.

It is of interest, by comparison, to find an educational psychologist (Lock, 1978) arguing that educational psychologists should contribute directly to the teaching process and make assessments of children with learning difficulties in the context of the classroom: the fundamental mistake in our present approach to many problems is to divorce assessment from teaching. The teachers, it seems, are reaching the same conclusion from their own perspective.

However, the fact that it may often be desirable and practical to use task analysis in combination with assessment of learner abilities and readiness does not make the approach equally suitable for all purposes. De Cecco and Crawford (ibid) make the point that not all topics or courses are equally analysable into behavioural objectives. In some contexts freedom to change objectives may be desirable; nor is it always possible to specify qualitative judgments of performance.

Section 2.

Variations in individual abilities and approaches to learning

i. Individual differences

The literature concerned with individual differences varies in its subject matter. One strong tradition, represented by a collection of essays edited by Gagné (1967), is concerned with individual differences in performance on each of a range of learning tasks. On verbal learning, for instance, Jenkins (1967) distinguishes between incidental and intentional learning and reports on a range of experiments which suggested that the difference between the two is a function of the differential responses evoked from the subjects by stimulus materials. Fleishman (1967) summarising his own and the work of other investigators, refers to 19 individual difference variables under the general heading of motor learning; of more than 200 tasks administered to thousands of subject differences in these abilities were shown to account for differences in performance. While concluding that 'in the perceptual motor domain a relatively few abilities are very useful in organising quite meaningfully a wide variety of performances' he also remarks that 'the specification of an individual difference variable is an arduous and exacting task', a point which quickly becomes apparent to anyone who reads these essays.

Another research approach is directed towards a comparison of performance between individuals strong or weak in a particular type of ability, eg verbal or spatial. Carrier and Clark (1977) report on research into spatial ability, including studies which showed that when no instructions were given high spatial ability subjects were superior to low ability ones in solving syllogisms, problems of time rate of travel and logical deduction. They also refer to various investigators who have compared differences in performance on the same task between high spatial ability and high verbal ability subjects.

It is a reasonable supposition that such differences in ability may affect the learner's preference for different instructional media. But while a number of investigators (reported by De Cecco, 1968) have studied the effectiveness of different types of media, none of these considered the relationship between individual differences in ability (eg. spatial or verbal) and individual preferences for instructional media. Ruskin (1977) in their review of personalised methods of instruction refer to systems which take account of student preferences on media.

Learner readiness for a task and rate of learning are other aspects of learning which can be considered under the heading of individual differences. Such differences are observed from learners' performance and are treated by all investigators as essential attributes to be considered when planning the individual's learning.

Another area of individual differences on which important work has been done in recent years concerns the effects of personality on learning performance. An article by Elliott (1972) concerning the relationship between reading age and extroversion in primary school children is illustrative of one type of investigation in this area. Entwistle (1972) discusses the general finding that whereas extroversion and stability tend to be linked with attainment at the primary school, attainment is associated with introversion and neuroticism in higher education students; there is apparently an abrupt reversal of these relationships after the age of 14, especially between introversion and attainment. The effect of motivation on attainment (eg. Entwistle, 1968) is also the focus of many studies. The work of Bennett (1976) and associates offers one of the most comprehensive studies to date of the variety of teaching styles and pupil personality types at primary school level. The relationships which are shown between different teaching styles, pupil personality types and levels of attainment, suggest a number of ways in which personality may interact with different aspects of the learning environment and bear further investigation.

The limitation of these studies as far as the 'How Do I Learn?' project is concerned is that none of them helps to show how the learner's personality and motivation may affect his/her perception of a particular learning task. Also the majority of such studies deal either with pupils below the age of 16 or, at 16 plus, only with groups which have been selected on the basis of academic attainment, ie. those studying 'A' levels or in higher education.

ii. Learning strategies

The terms 'learning strategies' and 'learning styles' are often used interchangeably. De Cecco (1968) gives learning strategies as examples of learning styles and Pask (1976) uses the two terms together in the title of his article. Confusion about terms is probably to some extent a reflection of the difficulty of discussing mental events and processes, but whereas the area of behaviour to which the concept of style applies is perhaps necessarily vague, it is possible to distinguish a more precise meaning for learning strategy.

Barnes (1975), whose discussion of teaching methods is primarily focused on ways of encouraging pupils to use appropriate learning strategies, does not provide a definition of the term, but the contexts in which he discusses learning strategies are mainly problem-solving ones. Problem-solving is also the area of learning through which Gagné (1977) approaches his definition and exploration of 'cognitive strategies'; his treatment of the latter comes closer than any other account to providing a satisfactory understanding of what learning strategies might be.

It may be recalled that 'cognitive strategies' constitute one of the categories of Gagné's 1977 taxonomy. On first acquaintance, the idea that 'cognitive strategies' represent a category of what is learned seems odd since, one supposes, cognitive strategies are what are used rather than learned. Such strategies, or skills, however, have to be learned before they are used. Gagné describes them as the skills by which learners regulate their own internal processes of attending, learning, remembering and thinking. Examples he gives include the ability to recall rules relevant to a problem, the ability to combine rules into a hypothesis and the ability to match specific instances to a general class. He thinks that cognitive strategies typically are learned from problem solving, but his discussion of the use of intervening links in the learning of lists or paired words, of mnemonics, and of other means of organising the learning of verbal information also refers to cognitive strategies. These may be self-initiated but equally can be suggested by the teacher. A general characteristic of cognitive strategies is that they are largely independent of specific content or subject-matter; once acquired they can be applied to a great variety of situations. He also says it is probable that an individual's acquisition of and effective use of them improves over long periods of time rather than in the course of a few days, weeks or even months. Our knowledge of them, however, he thinks is very limited.

Gagné's discussion of cognitive strategies is confined to cognitive types of learning and they are not mentioned either in the context of motor skill learning or attitude learning. Learning of motor skills and of attitudes, however, according to his account, in both cases involves some cognitive skills and these presumably could involve the use of cognitive strategies. The learner could, for instance, choose an effective way of memorising the stages of a procedure involved in a motor skill or could decide to break a motor act into part-skills for practice. (These strategies alternatively might be suggested by the instructor.)

No writer who uses the term 'learner strategies' seems to have anything different in mind from what Gagné means by cognitive strategies. So from this point the two terms will appear together.

The main problem with studying cognitive/learning strategies is identifying them, since by definition they refer to internal processes. One solution, illustrated by the work of Bruner and Pask respectively, is to limit the choices that can be made in arriving at a concept, then to set a task which involves one or more of those choices and observe what people do when carrying it out.

The question with which Bruner (1956) concerns himself is the way in which the individual poses hypotheses and eventually reaches a conclusion about the nature of a concept on the basis of various encounters with it, supposing that no-one else supplies an explanation. What Bruner calls the selection strategy is the individual's manner of making a series of hypotheses. 'A strategy is inferred from the pattern of decisions one observes in a problem-solver seeking to attain a concept.' Bruner and his associates investigated selection strategies, as thus defined, by giving subjects a card which illustrated a pre-chosen concept. By asking questions about other cards which shared some of the same characteristics as those shown on the target card, and receiving positive or negative answers to one's hypothesis, one could arrive at an explanation of the basis on which the first card was chosen. Bruner analysed four possible ways of formulating and testing out hypotheses, but in practice found that most subjects chose variations of two of them. Scanners are people who formulate hypotheses and then look for examples by which to test them; when a hypothesis fails they try another. Focusers take an example, one card, and use it as a focus by which to compare other cards so that they can see which characteristics of the first card are essential and which are not. Bruner found that the strategies adopted varied to some extent with circumstances; for instance, if subjects have a system for recording information they may adopt a more ambitious approach, potentially more informative, than if they have to remember what they have learned. The risk a person is prepared to take may also depend on the number and cost of opportunities for making choices. However, although conditions were shown to have effects in general on the way that people behaved the experiments reported in *'A Study of Thinking'* did not follow subjects as individuals and compare one with another in the type of strategies they adopted. The subjects were all Harvard undergraduates or graduates.

Although Pask (1976) uses the term 'style', the mental processes he studies are clearly learning strategies in the sense that Gagné and Bruner use the term. The tasks he sets his subjects, however, are much more complex than Bruner's, and not entirely comprehensible from his own accounts. Daniel (1975) provides a guide to Pask's work in general. The tasks set, according to him, consist of taxonomies of information about various imaginary creatures presented on a series of cards. Subjects are asked to learn the taxonomies by using the task cards in any order (s)he wishes and also to say aloud which hypothesis and questions (s)he is entertaining. In the study described by Daniel, and others summarised by Pask (1976), learners were identified, on the basis of their behaviour when performing those tasks, as serialists or holists. Serialists learn step by step, forming rather simple hypotheses as they move from card to card, and tend to have only one goal and working topic at a time. Holists test hypotheses about complex predicates, have many goals and working topics in view and consequently use the cards in a different way from the serialists. The design of Pask's experiment tends to elicit either of these two extremes; in more relaxed conditions of normal study the differences, according to Pask, are more likely to be matters of degree. In these circumstances students who are disposed to act as holists are characterised as comprehension learners, those who act more like serialists as operation learners. There is yet another group described as versatile learners who are able to perform well in either way depending on the subject matter to be learned.

In an independent study Robertson (1978) used Pask's method of observing routes taken by students through complex learning material. On a small sample (14) he found positive relationships between a broad strategy in learning, a flexible approach to problem-solving and the ability to deal with cognitive complexity. His broad strategists appear to be similar to Pask's comprehension learners, but with some added versatility.

The work of Bruner and Pask suggests that it is possible to observe and record certain kinds of learning strategy on a limited range of tasks in carefully controlled conditions which, however, may not resemble very closely the conditions in which people normally learn.

Diagnosis of an individual's learning strategy for these reasons is not likely to be possible in an ordinary educational setting. Another limitation of existing work as far as the 'How Do I Learn?' project is concerned is that it appears to have been done only with sixth formers or students in higher education. Certainly none of it has been focused on learners whose learning by normal criteria is judged as poor.

iii. Learning styles

When the term 'learning style' is used synonymously with 'learning strategy' it is usually because the latter, whatever type it is, is supposed to be characteristic of the learner's overall approach to learning. Pask (1976), it has already been noted, acknowledges that students are unlikely to exhibit the pure form of either strategy in normal learning conditions. De Cecco (1968) argues that the type of strategies selected by the individual are likely to be personal to him or her; this will be one aspect of his/her learning style. The difference in terminology may also be a reflection of the research method used. Investigators tend to talk about strategy when the method they use enables them to describe what the learner does as (s)he proceeds; subsequently the strategy can be mapped. Comments on style tend to be based on important differences observed between the outcomes of individuals' performances on particular tasks or aspects of them; from such crucial differences, and on the basis of subjects' self-reporting, differences in overall style are inferred.

The distinction made by Marton and Saljo (1976a) between deep-level processors and surface-level processors obviously has something in common with Pask's holists or comprehension learners and serialist or operation learners. Marton's and Saljo's subjects were asked to read passages of prose, and were subsequently asked to answer some questions on it and to explain to the experimenter what it was about. An initial finding was that different students gave quite different accounts of what the passage was about, varying from explanations of the main points and arguments, through descriptions which gave only part of the author's argument and showed misunderstanding of his main point, to accounts which were virtually empty of content. (This kind of finding is not possible on Pask's system which requires the subject to continue working until (s)he is in command of the taxonomy and its content.) These kinds of differences are of course what typically result from giving students the same academic task. In a similar experiment where university students were given a newspaper article to read, similar levels of outcome were discovered by asking the subject to recall what (s)he had read and to asking him/her to summarise the article in one or two sentences. The next stage was to ask the subjects how they had proceeded when reading and learning. Two different levels of processing were discernible: surface-level processing in which the subject focuses on the discourse itself or on trying to remember everything in it; deep-level processing in which the subject concentrates on what the discourse is about. There was a clear tendency for deep-level processors to be more successful in explaining the main argument of a prose passage; the surface-level processors, as self-reported, were those who had given an incomplete or misleading account of what the article was about. Svensson (1976) on the basis of some other experiments, makes a distinction between students who adopted an atomistic (compare operation learners or surface-level processors) and a holistic approach (compare Pask and deep-level processors). While the type of task and experiment makes a difference to the kind of dimensions along which subjects can be placed, and while these differences are important for a full theoretical understanding of the processes involved, it seems reasonable to conclude that Pask, Marton and Saljo, and Svensson are concerned with very similar aspects of the learning process.

Studies of students' note-taking habits (Howe and Godfrey) show large variations in the quantity and nature of notes taken, but no correlation was established between any particular type of notes and students' ability to answer questions on the lectures from which the notes were taken. This analysis related to the number of words, number of abbreviations, use of definite and indefinite articles, and to some extent the nature of what was recorded. Greater attention to the content of what students record in comparison with the message of the lecture might, on the basis of Marton and Saljo's findings, be more productive of findings about effective note-taking strategies.

Witkin and associates (1977) refer to a person's style as the characteristic approach (s)he brings to a wide range of situations, an approach which 'encompasses both his perceptual and intellectual activities'. The dimension of behaviour which they have been studying for many years is the extent to which the individual is 'field-independent' or 'field-dependent'. This is a measure of the extent to which an individual's perception or judgment of a part of the environment is influenced by its surroundings. Experiments used to establish this include asking the subject to adjust a rod, in a tilted frame, to an upright position, seating the subject in a tilted chair in a tilted room and asking him/her to adjust the chair to an upright position, and giving the subject the 'embedded figure' test in which the subject is asked to find a simple geometrical shape in a more complex figure which includes it. Those people who can find the upright or the figure easily are field-independent; those who cannot do so are field-dependent. In an article summarising a considerable number of studies relating to this dimension, Witkin claims that a tendency towards field-independence is associated with an interest in abstract and theoretical questions, a tendency to be motivated by intrinsic or self-defined rewards and and ability, when learning, to make use of mediators or to provide them oneself. Field-dependent people, by contrast, are more sensitive to social cues and have greater liking for people, are responsive to extrinsic rewards and punishments, and tend in learning to benefit from being given a plan or structure; they are more likely than field-independent people 'to rely on characteristics of the learning task itself'. The extent to which individuals need to be extrinsically rewarded and the extent to which they benefit from structure in learning tasks are aspects of learning over which the teacher or instructor has a fair amount of control. Whether a simple method of diagnosing such tendencies, however, by the embedded figure test alone, for instance, would be valid cannot be judged on the basis of the information in this article, but might be worth investigating.

Another method of diagnosing what is probably a relevant aspect of the learner's style is suggested by Ferla (1978) who refers to research on people's performance on problems devised by Inhelder and Piaget. These problems are designed to test the subject's level of thinking in the developmental range from concrete to formal operations. Research apparently has shown that only a small proportion of adolescents and adults reach the level of formal operations, in other words are able to apply general principles of problem solving to any problem. Another important point is that the ability to think at the formal level for one situation does not necessarily imply the ability to think at the formal level for other situations. The educational implications of this seem clear: there is no point in setting tasks which require the ability to apply general principles for people who have not yet reached that level of performance.[1] The special interest of Ferla's work is that the reasoning test he used to establish the level at which learners were operating was given to first year engineering craft students, in other words the kind of students to whom we would expect the 'How Do I Learn?' project to be applicable. Of the 73 students he tested, 6 were shown to be operating at the early concrete stage of reasoning, 21 were at the late concrete stage, 30 were at the early formal stage and 16 were at the formal stage. These apparent differences in reasoning ability, however, were not very clearly reflected in students' performance on their engineering course; the most that could be said was that students classified as early concrete operational reasoners were more likely than others to fail the first year course. Any level of reasoning above this was apparently adequate on the craft course. (It could be that the course did not significantly demand advanced operations.)

'Conceptual tempo' is sometimes regarded as an important aspect of the learner's style. Kagan (1966) reports on experiments concerning the extent to which children reflected before giving a response on a variety of problems with alternative solutions but only one correct response. Two trends were discernible and were summarised under the headings 'reflective' and 'impulsive'. The reflective child waited a long time before giving a response and had few errors. The impulsive child tended to answer quickly and was correspondingly more likely to make errors. Response time on the various tasks was shown to be relatively independent of verbal ability. Th experiments in question were cor ducted over a period of two year and tendencies towards reflectivit or impulsivity were shown to persis over time. Thirteen- and fourteer year-old children, the eldest testec showed on average a longer re sponse time than younger childrer While impulsivity in younger childre is probably explained by anxiety an intolerance of ambiguity, the 'dat are persuasive in suggesting tha reflection over alternative hypoth eses is a disposition that gain strength as the child develops'.

Thus, we find a variety of aspect of learner behaviour which can b considered under the headin 'learning style'. The one just discus sed, conceptual tempo, seems c questionable relevance to the 'Ho Do I Learn?' project because stu dents of 16-plus may well hav outgrown any tendencies toward impulsivity in learning, and also th kind of behaviour in question seem of limited importance. All the othe ways of interpreting learner styl might well have a bearing on variou cognitive aspects of learning.

But, except in the case of th Piagetian reasoning test, difficultie are envisaged about the practicabil ties or relevance of making assess ments of style, of the kind describec If it is decided to follow thi approach, it will probably be neces sary to develop suitable learnir materials and methods of assess ment specially.

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[1] Gagné's recommendation to analyse the learning task in order to discover the prior capabilities required for it reaches the same conclusion by a different route.

Section 3.

The relationship between the requirements of the task and learner characteristics

Here we extend the discussion of individual differences learning strategies and styles begun in the last section to consider to what extent it is possible to take account of such factors when advising students on the best way to fulfil various instructional objectives. We will also consider whether students' learning is likely to become more effective if such individual differences are taken account of, and discuss the implications for the learner of trying to do this.

Considering that learning strategies are likely to be one of the most difficult aspects of personal style to identify, they will probably be most difficult to advise learners about. How can learners capitalise on their own strengths, make up for their weaknesses or try alternative strategies unless they can observe and analyse their own behaviour? Gagné's answer (1977) to this question is cautious. Since, he says, we cannot identify, observe or measure cognitive strategies dependably, 'the best course of action appears to be to ensure that students have plenty of opportunities to learn independently, and to be frequently challenged to solve novel problems'. As a comment upon the situation of practitioners in schools, colleges or training colleges this advice seems sensible. However, Pask (1976), who would claim to have identified two types of strategy very dependably, has also apparently demonstrated the possibility of matching the method of learning to the strategy of the individual learner. Following upon observation of the ways in which subjects turned up the cards in the original task of learning the taxonomy of fictional animals, Pask and his associates were able to identify the ways in which holists and serialists proceeded. Two different linear instructional programmes for a new learning task were devised to match the two strategies: each provided a complete description of the taxonomy but the concepts they taught were different and differently structured. In a typical experiment learners who had already been identified as serialists and holists according to their first performance were given the new taxonomy to learn in either a matched or mismatched fashion, ie. holists were given a holist programme, serialists a serialist programme, and some of each type were given the programme which was NOT in line with their typical way of proceeding. A 30 item test of factual knowledge and the ability to generalise was then given. All members of matched groups scored between 28-30 whereas scores for mismatched students fell between 7-21 with an average of 14. Other experiments of a similar nature have reproduced the finding that matched learners learn well, mismatched groups poorly. The practical difficulties, however, of trying to proceed in this way in the classroom are obvious to Pask himself who describes as an alternative 'A Classroom Implementation of "Learning to Learn" Principles'. This does not involve simple matching but instead the use by learners of specially designed learning materials and 'training' in good learning habits. The subject-matter learners are given sounds sophisticated – extracts from 'Bateson, Castaneder, Jung, Kelly, Lilly, Schrodinger, Wittgenstein' – and, therefore, unlikely to be suitable for the majority of learners in the 16-19 age group. Pask claims that most 'trained students gain a general insight into structuring and learning an unordered and previously unknown collection of topics', but it is difficult to understand from his account exactly what the training involves and the importance within it of identifying typical strategies. It would probably be necessary to visit Pask's laboratories and obtain copies of the exercises and study guide he uses in order to see whether his methods could be adapted for a different population.

In a review of Pask's work, Entwistle (1978) concludes that the evidence on applicability is tentative, and that the method seems to have greater potential for science than for other subjects. He suggests that the next phase of the research should cover subject content and age ranges more systematically and should also use 'materials which are geared more directly to normal timetabling constraints'.

Clearly there are other ways in which theoretically it is possible to match instructional methods to learner characteristics or preferences, or to take account of those in the design of learning. Carrier and Clark (1977) summarise results from three sets of experiments which involved matching instructional material with learners according to their verbal or spatial reasoning ability. The 'instructional message' from science or mathematics in each case was the same but it was presented in two forms, one spatial, the other verbal. Results, however, generally were inconclusive. For instance, an investigation to find a relationship between spatial and verbal versions of a mathematical teaching programme used with teacher trainees failed to do so; both verbal and spatial reasoning tests predicted better for the verbal treatment than the figural one. One reason given for this type of result is that the two instructional messages, although intended to be the same, are not really so: verbal subject matter cannot be easily translated into spatial terms. By changing the medium one may change the message.

Levie and Dickie (1973) report a study in which the researcher asked Air Force personnel to state their preferences for learning from lectures or from the printed word. The subjects were then divided into two groups: half learned their preferred way, the others did not. No significant differences in learning were found between the two groups. A summary of a study by Mattern (1972) concerns different methods of accelerating students' reading rate. One group of college students attended classes where a method of reading rapidly was identified for them and the material in which they practised included a maximum number of cues and directions about how to proceed. Another group of students attended classes in which they were directed to experiment with a variety of techniques; the idea was to allow the student to identify the technique that was most useful to him/her. Both groups of students improved their reading rates, but results from reading rate tests showed that the students who had attended the structured classes made greater gains than those who had been encouraged to find their own best way.

Ruskin's review (1977) of methods which take account of the student's preferences concludes that any one of a number of good teaching techniques, including clearly defined objectives, is likely to improve student performance regardless of the instructional method used. Cheek (1977), whose stated ultimate objective is to relate learner and task characteristics to characteristics of instructional media, undertakes so complex an analysis of media in terms of their perceptual and conceptual characteristics, that the chances of making practical use of his insights seem virtually nil.

Although the studies just reviewed have negative implications for the idea of taking account of individual preferences or style when planning learning, it must be said that virtually none of them appears to have included a full diagnosis of what the learner's learning style or strategy was. The individual was identified either in terms of one type of ability – verbal or spatial – or was simply given a choice about the type of instructional method (s)he used.

This appears to be rather thin evidence on which to conclude that counselling of the individual with respect to his/her own preferences and/or learning style could not be a viable procedure. There are, however, indicators in these studies that the value of counselling may lie primarily in directing the learner (and teacher) to an understanding of the learning task itself and the best way to proceed, rather than to characteristics of the learner.

Several considerations point towards this conclusion. One is to do with the possible irrelevance of people's preferences or natural ways of performing to the actual requirements of the task. Although some learners may prefer invariably to work with verbal subject matter for instance, there is some material which cannot be adequately represented in this form. Similarly there are many ideas which can be expressed in words which cannot be conveyed graphically. Carroll (1976) writes: 'A child who has been taught spatially will have a concept of signed numbers different from the concept attained by a child taught with a purely verbal procedure, and even though the children may have the same score on a performance test, the differences might show up in dramatic form when the two children start to study some more advanced form of mathematics, say higher algebra'. Cronbach (1967) makes a similar point more strongly when he says that by encouraging poor learners to perform only in ways which come easily one may reinforce the learner's strengths and neglect weaknesses. In the long run this limits the learner's versatility.

This conclusion is compatible with findings about learning strategies and styles in general. While investigators begin from a neutral position, simply observing what subjects do when presented with different tasks, they rarely avoid the conclusion that certain strategies or approaches are better for certain purposes than others (Bruner, 1956; Entwistle, 1977; Marton and Saljo, 1976a; Pask, 1976). Ideally, the learner is versatile and versatility is a measure of his/her ability to adopt an appropriate method for the task in question.

Another consideration of importance arises from evidence that suitably structured material, which gives learners cues on how to proceed, contributes significantly to the kind of learning outcome. The studies made by Marton and Saljo and Svensson, to which reference has already been made, show that when cues were absent students spontaneously adopted different approaches to the reading of a text. But another study by Marton and Saljo (1976b) suggests that the form of the instructional message can influence the particular approach students adopt on a particular occasion. Two groups of students were given the same material to read in three sections. After each of the first two sections there were questions for one group asking them to state the main points that had already been made. The other group received questions of a more specific, factual kind. Answers students gave to questions immediately after reading and on a retention test 45 days later showed that what they remembered of what they had read was greatly influenced by the kind of questions they had received. Gagné (1977), page 45, also refers to a study of the effects of interspersed questions in texts, showing similar results.

There is also some evidence that the provision of cues can help to overcome learning difficulties. One of the studies quoted by Carrier and Clark (1977), dealing with differences between high and low spatial ability subjects, found that the previously recorded differences in performance on various tasks disappeared when all the subjects were given instructions on how to use the diagrams, maps and other symbolic devices included in the task material. The low spatial ability subjects were able to perform as well as the high ones once they had been directed towards the appropriate strategies. Howe (1976) quotes two studies as support for the same point. In one a large difference in ability between normal and retarded children on a discrimination learning task disappeared when all subjects were encouraged to attend to the appropriate cues. Similarly, the performance of mentally retarded adults was shown by another investigator to be greatly improved by giving instructions to form sentences from the word pairs. No such improvement was recorded as a result of giving the same treatment to normal adults and, it is argued, this must have been because they already possessed appropriate mediating strategies and used them of their own accord.

An experiment reported by Howe and Godfrey also suggests that the provision of an organising method may be redundant, or even counterproductive, for learners who already possess effective learning methods. But, in this instance the learners had been given one opportunity to learn the material from a lecture before they were given the same subject matter in the form of a diagram. This proved helpful to the subjects who had performed poorly after hearing the lecture alone, but not to those who had done well on the first test. Thus, there is some slight evidence that the provision of structure or cues may not always be helpful to people who spontaneously use suitable learning strategies; but note that in this instance the successful subjects not only were able to use these strategies, but had already put them into effect for the learning in question. In other words the diagram may have interfered with another strategy already adopted. Whether it would have been similarly counterproductive if introduced to all learners in the first instance we cannot say.

On balance, however, the research evidence points firmly towards the advisability of encouraging learners to adopt learning strategies suitable for the task in question. This can be done by including in the learning material appropriate cues and mediators. (A suitable source of guidance on the strategies likely to be appropriate for different kinds of learning would be Gagné's *Conditions of Learning* (1977).) This approach, the research evidence suggests, should help to maximise the learning of people who do not always adopt spontaneously a method which is effective. But, in those cases where there are still problems, more intensive individual treatment would seem to be appropriate, involving close scrutiny of the individual's performance in relation to learning objectives. At this stage it would be for the teacher to judge, taking into account the requirements of the task, whether it was best to capitalise on the learner's preferred methods of learning or to encourage alternative strategies. (Cf. Leach and Raybould (1977).)

Both methods can be expected to be effective only within a learning context where the other main tenets of good instruction are followed, eg. setting, where appropriate, clear instructional objectives, setting tasks which are appropriate to the learner's capabilities and keeping the learner informed about his/her performance.

However, this scenario might be thought by some to be too much teacher directed. Most advocates of the 'learning to learn' movement lay considerable emphasis on the importance of giving the learner control over his or her own learning. Boydell (1976), for instance, advocates a learning environment in which learners identify their own goals, select and generate their own resources, and are free from extrinsic threats and rewards. Thomas and Harri-Augstein (1976) stress the centrality of learner motivation, the fact that only the learner knows the learning experience within and that learning is valuable only insofar as the learner values the changes which have taken place. Roskin (1976) takes the view that the products of our present education system do not know how to learn – they know only how to be taught. Thus, the initiatives are taken by the teacher and the learner remains in a dependent role.

This section began with a question about the extent to which individual differences should be considered when advising students on the best way to fulfil various instructional methods. On the basis of existing research results, the best procedure seems to be to help the student to attend to critical aspects of any given learning task, and to encourage him/her to adopt methods of learning effective for that particular purpose.

Section 4.

Implications for the project

The review of the literature helps to clarify the issues surrounding the project, if only by establishing in certain respects that both the theoretical and empirical research are inadequate for its purposes:—

1. Much of the research is concerned with young people on 'A' level or university-type courses, rather than with the full ability range. However, there seems no reason to doubt that most young people know little if anything of the many distinctions about learning made by educational researchers.

2. Even when investigating the learning methods of more academic students researchers appear to have been mainly interested in making observations of the students' behaviour. If they asked them to report on how they went about learning, this seems to have been more for research purposes than to help the students improve their own ability to learn. There is virtually no information about learners' attitudes towards or expectations of the learning process.

3. Existing taxonomies of learning are highly complex and directed primarily towards those in the teaching profession. It seems unlikely that their presentation in the abstract would be much more help to most young people.

4. On the positive side, the clearest finding is that in order to help people learn more effectively it is better to concentrate on suitable methods for learning the task in hand rather than trying to 'diagnose' the strengths and weaknesses of the individual learner.

5. An approach which might have potential would be to present learners with a series of tasks specially structured and presented in order to help them see precisely what they should be doing when carrying out a particular learning task. In this way they might be helped to see how they could adopt learning methods for themselves when these are not explicitly demanded by the learning material or by the teacher. The overall direction of a 'How Do I Learn?' course would then be from experience of good learning methods towards reflection about ways of transferring those methods to other situations.

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FEU Response to: MSC New Training Initiative – a consultative document (May 1981)	July 1981
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FEU Guidance Notes

No 1 – MSC/SPD: Further Education Staff Training: YOP Fees Discretionary Supplement in England and Wales
No 2 – Some useful addresses associated with the Microelectronics Education Programme (MEP)

Priced Publication

FEU/WMAC August 1980
YOP Survey in the West Midlands (available from the West Midlands Advisory Council, Norfolk House, Smallbrook Queensway, Birmingham B5 4NB; price £1.25

Copies of these documents (which are free of charge) are obtainable, while stocks last, from the Publications Despatch Centre, Department of Education and Science, Honeypot Lane, Canons Park, Stanmore, Middlesex HA7 1AZ (Tel: 01–952–2366 Ext 503).

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